

1980 ANNUAL REPORT
FIELD SERVICES IN EUROPE

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I INTRODUCTION

I INTRODUCTION

A. OVERVIEW

- This report is the first annual report of the European Field Service Programme, modelled after earlier INPUT studies on the same topic in the U.S. and Europe.
- The basis of the analysis is information gathered from end users and vendors by mail questionnaires similar to those used for the U.S. Field Service Programme Annual Report. This allows a point-to-point comparison of results of the information obtained from the two markets that will be made in a subsequent report entitled Europe - U.S. Comparison Report.
- Although the principal countries within the study, France, Germany and the U.K., are members of the Common Market, they cannot be treated as one market. This report takes an overview of Europe as a whole, after which each country is studied as a separate entity.
- The Common Market still has a long way to go before the individual cultures, languages, business attitudes and economic aspects are overcome to form a true common element.
- The Common Market remains an association of divergent countries struggling to establish a cohesive unity. Current economic pressure from the deepening

economic depression are not assisting the establishment of the unity necessary for the Common Market to be as effective as visualised in the Treaty of Rome.

- Nevertheless, data have been analysed where results would be meaningful on a total Western European standpoint.
- The results of the study provide insights into:
 - Users' requirements for maintenance services in practical terms; reinforcing some myths, yet exploding some of the long-held, traditional views of vendors.
 - The increasing competition in the marketplace for maintenance services by vendors of equipment and third-party organisations.
 - The major maintenance personnel issues in the service organisations active in the market today.
 - The growing importance of field service as a major contributor to corporate revenues and to profit.
 - The market trends in all areas that affect system maintenance, be they hardware, software or technique.
 - The difference in the requirements for service of terminals, peripherals, minicomputers, small business systems and medium- and large-scale mainframe systems.
- To provide the interview base, end user questionnaires were mailed to medium- and large-scale end user installations. A response of 336 completed questionnaires reflects the growing importance that the user places on maintenance. Even French end users, notorious for their reluctance to provide information, responded in significant numbers.

- Unfortunately, this was not true of the French vendors: despite much chasing by INPUT staff, only three French vendors returned questionnaires. It was also disappointing that the world's largest computer supplier refused to complete the questionnaire, though information on this firm was gathered from other sources. The careful study of news releases coupled with attendance at consultants' briefings bridged this information gap.
- Every effort has been made to include all data collected during the study. A section of graphs of supplementary data has been included as an appendix to this report for those readers desiring additional detail.

B. STUDY INTERVIEW PROGRAMME

- The countries covered in this report include:
 - United Kingdom.
 - France.
 - West Germany.
 - The Netherlands and Belgium.
 - Sweden and Norway.
- Vendor interviews were conducted with:
 - EDP mainframe vendors.
 - Terminal manufacturers and distributors.
 - Minicomputer vendors and distributors.

- Third-party maintenance vendors.
- Specialised equipment vendors related to the computer industry.
- National and multinational organisations.
- End user interviews were conducted with:
 - Companies in the medium- to large-size range, as qualified by revenue.
 - EDP managers.
 - The whole spectrum of user industries including banking, education, data processing, manufacturing and retail.
- All interviews were by mail and carried out in:
 - Vendors - all in English.
 - Users - English, German or French.
- The total interview sample size was:
 - End users - 336.
 - Vendors - 41.
- This study is designed to provide continuity with earlier work, and to establish a base on which to build future work. INPUT encourages and depends upon comments and questions from clients concerning the data, presentations and topics related to the European Field Service Annual Report. Clients should also feel free to comment on any of INPUT's completed work and to suggest topics for future study.

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

A. MAINTENANCE MARKET, 1980-1985

- The field service organisations of most companies are now emerging from under the IBM umbrella and its de facto standards.
- With the move to profit centre organisations and the continuing unbundling of service, the old perceived constraints are crumbling and field service is emerging as a true business.
- Four primary factors now influence the Western European field service industry:
 - The change in equipment mix continues from mainframes to more small business computers, intelligent terminals and I/O devices. This aids maintenance revenues since percentage maintenance charges are higher on the lower priced equipment.
 - Inflation problems are compounded by the monetary controls and price increase limitations introduced by various national governments. Multinational companies can no longer apply a general price change to all European prices.

- The geographic dispersion of more and more different types of equipment is accelerating. To some degree, field service is capitulating to sales and marketing pressures by allowing equipment to be sold in unsupported areas. This has resulted in an increasing number of users becoming unsatisfied with response times. Little user education has taken place, so that users expect response times similar to industry norms established at central sites over the past years. This problem has been further amplified by the shortage of trained engineers.
- Technological convergence toward a digital-based industry is accelerating, and the office-of-the-future is becoming a reality. The traditional demarkation lines between digital computers, the telephone industry and photocopier, communications and office equipment are disappearing. Because companies are diversifying into new areas, field service must learn new skills and business environments. One advantage is the opening of a wider net for engineer recruiting. More cross-fertilization of engineers can and will take place.
- These four factors are agitated and modified by the additional influences of:
 - Demand for improved productivity and profit.
 - More first-time users.
 - Increase in cost of personnel.
 - Decline in cost of hardware.
 - Advances in technology.
 - Customer demands and expectations.
 - New maintenance techniques.

- The range of forces acting on field service is shown in Exhibit II-1.

B. MAINTENANCE REVENUES

- INPUT forecasts that maintenance revenues in Western Europe will increase at a 17.5% average annual growth rate (AAGR) during the 1980 to 1985 period. The year-to-year projections are shown in Exhibit II-2, which include an estimated annual inflation rate of 12%. This growth will be driven mainly by the increase in the installed base, change in product mix and changing emphasis resulting from increased attention to profit objectives.
 - Many vendors, predominantly mini and microcomputer suppliers, will experience rapid and, to some degree, out-of-control growth of a type similar to many vendors' experiences in the mid-1970s.
 - As the intensity of corporate expectations focuses on field service, companies will pursue a more aggressive pricing and selling policy on maintenance services, which will impact and accelerate the price performance expectations. These factors are discussed in greater depth in INPUT's report entitled Marketing Of Field Service.
- The expected maintenance revenue per unit is dropping. This fact is exemplified by an IBM user replacing a 370/138 with a 4331; this user will only pay 14% of the previous maintenance charge on the CPU. This indicates that IBM is expecting a dramatic reduction in costs of maintenance as regards the 4331 CPU, compared to the 370/138.
- However, this does not mean a reduction in the overall maintenance charges for a 4331 system, as revenue growth will be sustained by the maintenance charges on terminals, ancillary peripherals and software.

EXHIBIT II-1

FORCES ACTING ON
FIELD SERVICE

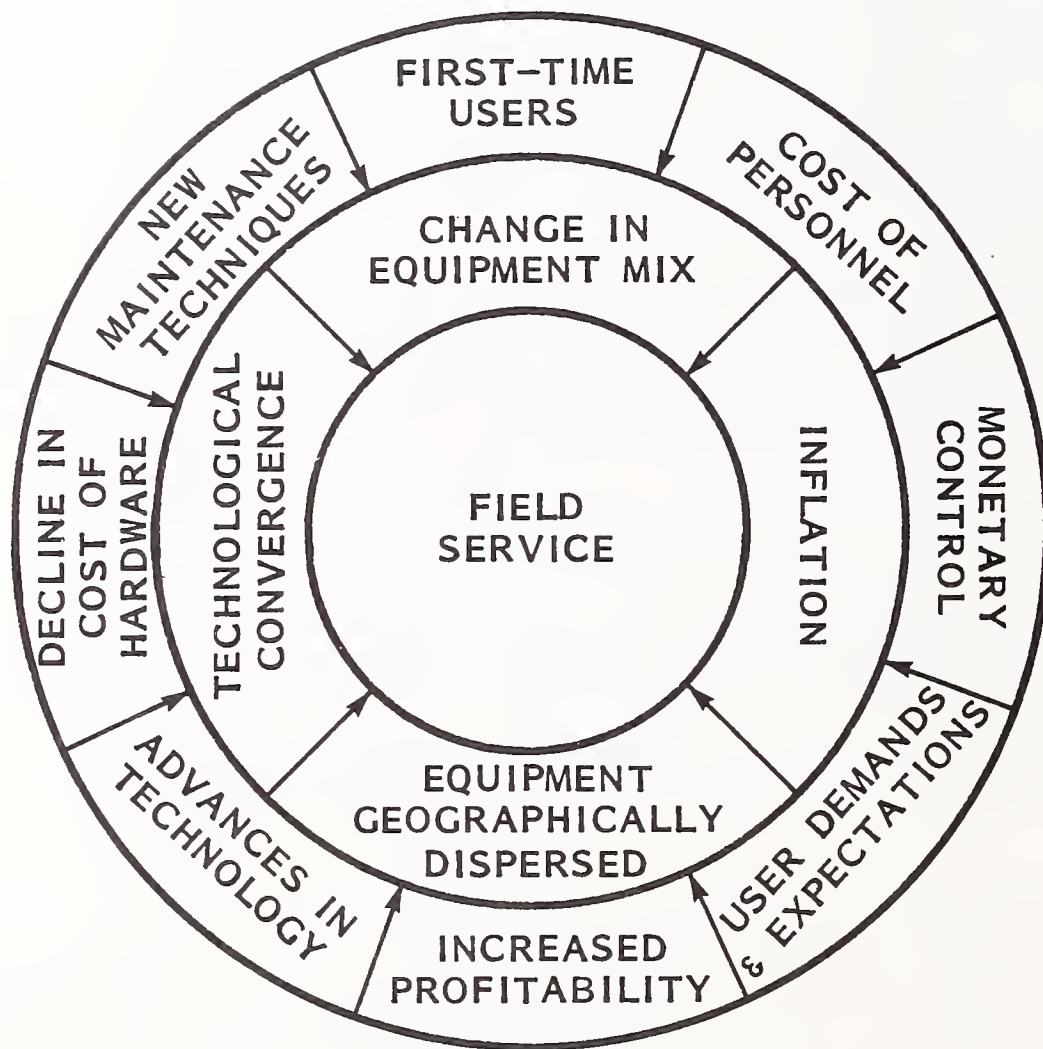


EXHIBIT II-2

WESTERN EUROPE FIELD SERVICE REVENUE AND EMPLOYMENT FORECAST, 1980-1985

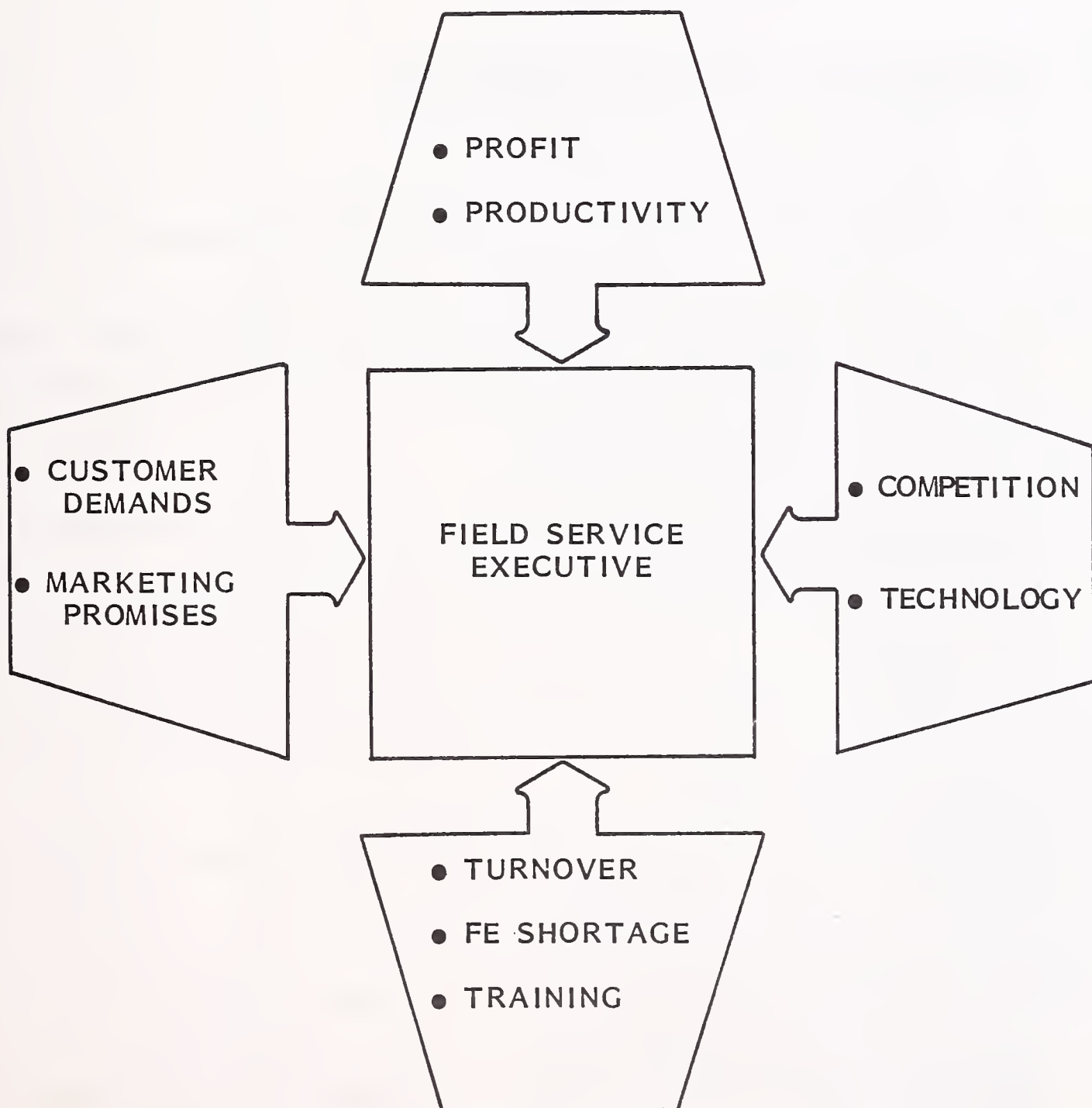
YEAR	FIELD SERVICE REVENUES (\$ BILLION)	NUMBER OF FE's (000's)	TOTAL VALUE OF INSTALLED BASE (\$ BILLION)
1980	3.5	52.0	44.4
1981	4.1	55.0	48.7
1982	4.8	58.0	53.5
1983	5.6	61.0	58.8
1984	6.6	64.0	64.6
1985	7.8	67.0	70.9
AAGR	17.5%	5.2%	10.0%

C. PERSONNEL

- The field service executive remains the man in the middle, as conceptually shown in Exhibit II-3, impacted on all sides but most seriously troubled by personnel problems.
 - Good-quality, reliable engineers will continue to be in short supply in all major European countries.
 - Turnover continues at a high rate, averaging 26% for the vendors responding to the INPUT survey.
- INPUT estimates that there are 52,000 engineers now engaged in the maintenance of digital-based data processing equipment in Western Europe. This force will grow at an AAGR of 5.2%, reaching 67,000 engineers in 1985.
 - This relatively low rate results from the introduction of more sophisticated maintenance techniques, improved productivity of the engineers and greater involvement of the user in problem determination.
 - One major multinational vendor reported that the next two years will be used for consolidation, with zero growth in the number of FEs employed.
- One factor many vendors are waking up to is that you can no longer solve a service problem by employing more engineers. Many smaller vendors have still to learn this lesson.
- Competition is the prime source of recruiting for the majority of small- to medium-sized companies. This throws a heavy burden on the larger companies, as they carry out the initial training of engineers. However, field service managers of these smaller companies are forecasting a shift to performing

EXHIBIT II-3

THE FIELD SERVICE EXECUTIVE - MAN IN THE MIDDLE



more initial training themselves, resulting in the prime source of engineers becoming internally trained, first-time engineers by 1985.

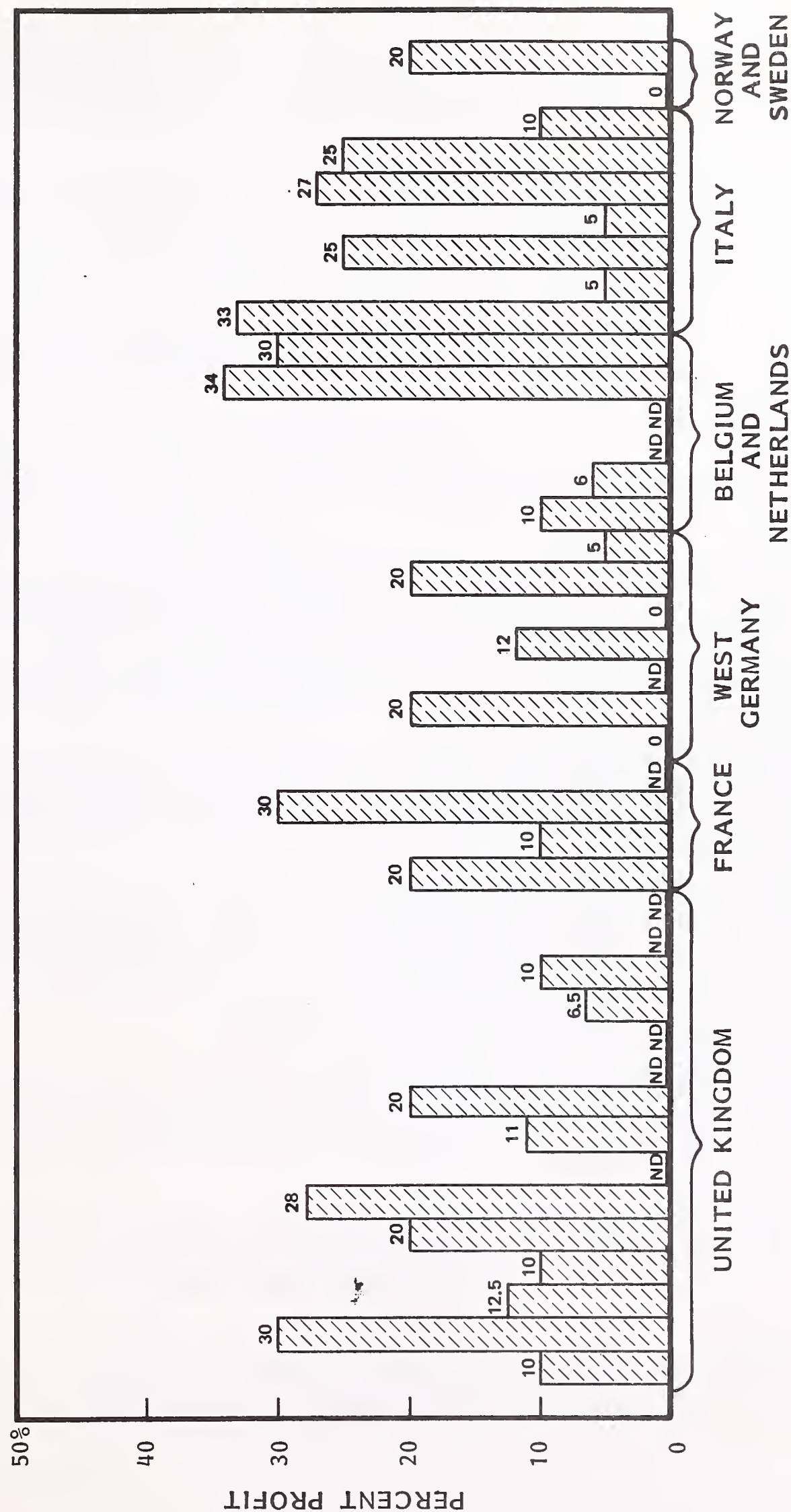
- Education, a traditional reward to engineers, will be accomplished by course work designed on the self-study, self-paced concept.
- CDC is well advanced in these new training concepts, with many engineers being trained on their 'Plato' computer education system.

D. FIELD SERVICE - A PROFITABLE BUSINESS?

- The drive continues to make field service into a true business environment.
 - Senior executives are realising the value of the field service organisation as a significant revenue producer, and with correct management, a major provider of profit.
- Of the 41 companies interviewed, 78% were currently operating their field service organisations as a profit centre, while 50% of those remaining stated they would convert from a cost centre to a profit centre within three years.
 - Profit objectives showed wide variations from 0-34%, as shown in Exhibit II-4.
 - Multinational companies had higher profit objectives, usually above 22%.
 - The overall average for all responding vendors was 17.8%.
- Many field service managers admitted that they were having difficulty in finding the balance between service and profit.

EXHIBIT 11-4

PROFIT OBJECTIVES OF RESPONDING FIELD SERVICE ORGANISATIONS



ND = NO DATA

- This difficulty was often reflected in frequent reorganisations and changes in reporting structures and procedures.
- These changes tended to upset the user and cause concern and apprehension among the staff.
- Traditionally, engineers are 'givers'. Servicing the user is often their prime concern, with the requirement for profitability a long way down the list of important items.
- Profit margins are, at many vendors, well below acceptable levels.
 - Though it is easy to pass profit and financial constraints down to lower-level managers without the correct education and background, these managers often sacrifice profit in the interest of service. First-line managers can expect greater pressures to improve this situation.
 - It is up to senior executives to ensure these managers have the correct training and business understanding to achieve these goals.
 - Care must also be taken to fully understand the accounting principles which are used in defining profit goals; these principles will have a major impact on the profit result and may not always reflect the competence of the management.
- There is a drive from within the industry to stabilise and rationalise maintenance pricing.
 - In Europe, unlike the U.S., there seems to be a degree of reluctance by vendors to publish their price structures.
 - The reason for this is unclear, but is assumed to be a fear of giving competitors some advantage. INPUT does not hold with this concept

and considers it helpful for vendors to be more open with pricing details.

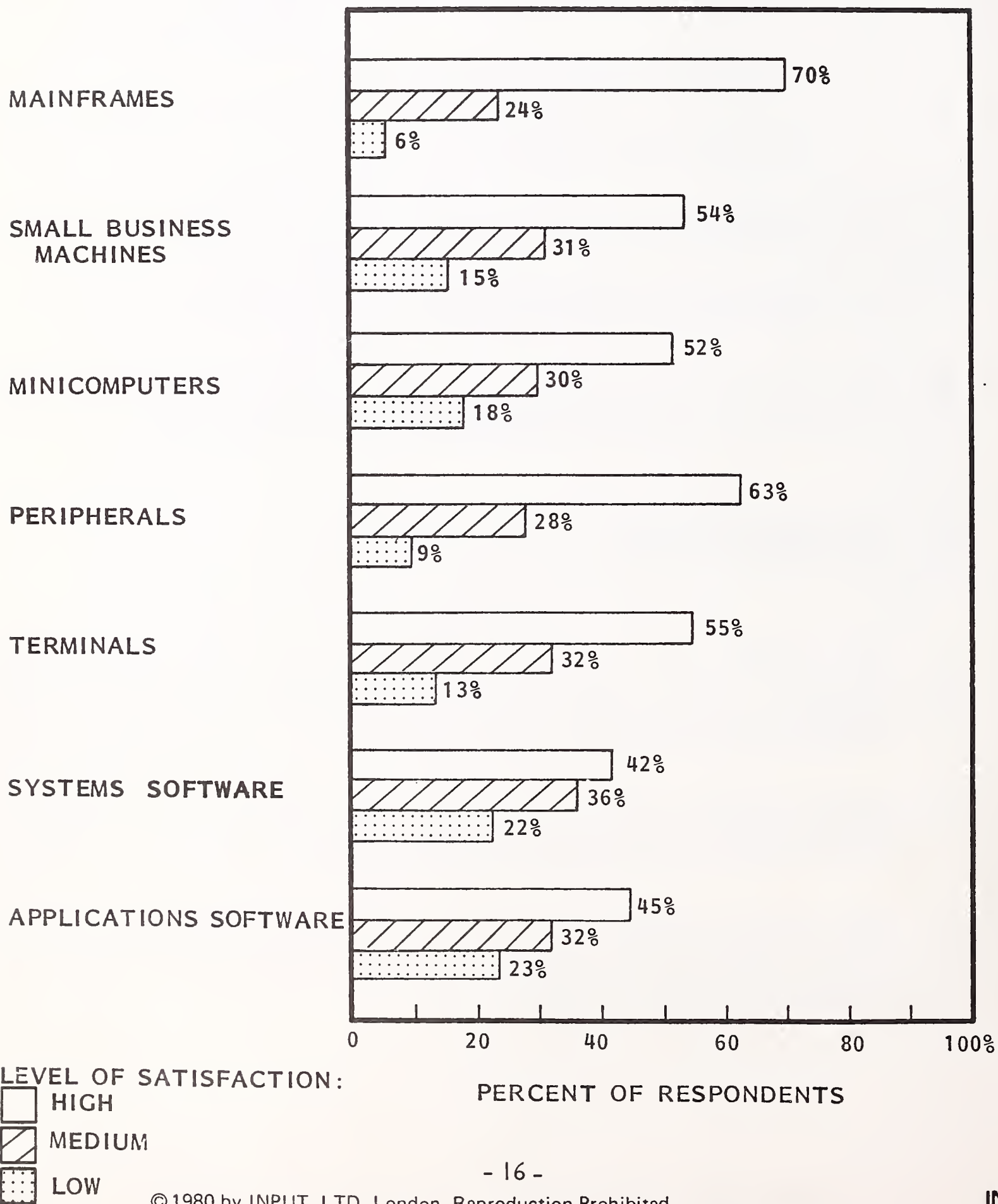
- Field service managers who are now becoming more aware of business elements and are being judged on profits achieved can no longer provide ancillary services to the internal organisation at cost. These services include:
 - Installation of equipment.
 - Installation of engineering change notices.
 - Provision of R&D assistance.
 - Maintenance of in-house systems.
 - Assistance in tender preparations.
- To quote one senior field service manager, 'Why should I provide manufacturing with an engineer when he could be out earning real money!'

E. THE EUROPEAN USER

- The European user is generally satisfied with the level of field service provided. This is particularly true on mainframe maintenance, though software maintenance leaves much to be desired.
- Exhibit II-5 shows the user rating on a scale of 1 to 5 (with 5 high) of maintenance as a product in Western Europe.
- While generally satisfied, many users are far from pleased with engineers' response time and length of repair time; these often fall below what a user considers as a minimum acceptable level.

EXHIBIT II-5

USERS' GENERAL SATISFACTION WITH MAINTENANCE IN WESTERN EUROPE



- Exhibit II-6 shows the average number of hours 80% of respondent users perceived for response and repair times.
 - Only in peripherals are users receiving better than their minimum acceptable level for response time.
 - For repair times, users are often receiving the minimum acceptable level.
 - Software users, of both systems and applications software, are not receiving acceptable minimum times for either response or repair.
- It is INPUT's opinion that users are not at their 'pain threshold' on the question of maintenance pricing. It is important to remember that maintenance costs are only a small part of the total EDP budget.
- Exhibit II-7, produced from data acquired from INPUT's European Market Analysis Service subscription programme, shows the distribution of an average EDP user's budget, the breakdown between central and remote sites, plus the changes anticipated in 1981.
 - In 1980, an average EDP user spent 4.6% of his budget on hardware and software maintenance.
 - In 1981-1982 this will increase to over 5%.
- Engineer turnover is too high for the users' comfort and has an unsettling effect on relations between vendor and user. This is highlighted by comments given by the users interviewed. Typical comments were:
 - 'They try to solve the problem by reorganising and moving people.'
 - 'No sooner do we get a good engineer than he leaves. The managers must be bad.'

EXHIBIT II-6

AVERAGE RESPONSE AND REPAIR TIMES PERCEIVED BY USERS

EQUIPMENT TYPE	RESPONSE TIMES (HOURS)			REPAIR TIMES (HOURS)		
	IDEAL	CURRENT AVERAGE	MINIMUM ACCEPTABLE LEVEL	IDEAL	CURRENT AVERAGE	MINIMUM ACCEPTABLE LEVEL
MAINFRAMES	1.1	2.1	1.9	1.7	3.2	3.4
SMALL BUSINESS SYSTEMS	2.1	3.9	3.2	2.7	3.9	5.0
MINICOMPUTERS	3.2	5.0	3.9	3.0	3.9	3.9
PERIPHERALS	1.7	3.4	3.6	1.6	3.4	3.4
TERMINALS	3.0	7.0	7.0	1.6	3.6	3.7
SYSTEMS SOFTWARE	7.0	22.0	11.0	17.0	38.0	21.0
APPLICATIONS SOFTWARE	9.0	24.0	10.0	12.0	108.0	16.0

EXHIBIT II-7

**RESPONDENTS' BUDGET BREAKDOWN BETWEEN CENTRAL
AND REMOTE SITES, 1980-1981**

BUDGET CATEGORY	1980 BUDGET PERCENT OF TOTAL	PERCENT SPLIT BETWEEN SITES		CHANGE ANTI- CIPATED 1980-1981
		CENTRAL	REMOTE	
PERSONNEL	40.0%	91%	9%	+13%
MAINFRAMES	19.6	88	12	- 8
PERIPHERALS	13.6	89	11	+ 9
MINICOMPUTERS	3.2	54	46	+19.6
TERMINALS	4.0	53	47	+19
COMMUNICATIONS	1.9	75	25	+24
SOFTWARE	3.0	90	10	+16
MAINTENANCE	4.6	87	13	+15
PROCESSING SERVICES	6.3	77	23	-10.3
SUPPLIES AND OTHER (INCLUDING PROFES- SIONAL SERVICES)	3.8	86	14	+10.3
TOTAL	100%	79%	21%	10.8%

DATA FROM INPUT'S MAS PROGRAM

- 'We pay enough in maintenance so why do the engineers leave?'

F. PROFITABILITY - THE KEY GOAL

- Profitability must be accepted as the primary goal of each field service organisation. Short-term steps to this end include:
 - Developing a profitability attitude.
 - Improving productivity.
 - Building a marketing organisation.
- Development of a profitability attitude requires that:
 - First- and second-line managers be educated to accept the business manager role.
 - All levels within the field service organisation be made aware of corporate objectives and their contribution to achieving these goals.
 - Reporting systems be extremely important to the development of profit orientations.
 - Profit and service not be dynamically opposed, as the traditional engineer purports.
- Productivity is a continuing key factor in improving profit goals.
 - Accurate time reporting is essential to measure productivity. FEs must be carefully monitored and encouraged to report such items as non-productive time.

- Field service management must also implement procedures.
 - Evaluate and introduce cost effective techniques including:
 - Remote diagnostics.
 - User-aided diagnostics.
 - Depot maintenance on low-cost items.
 - Educate the user in realistic expectations on response and repair times.
 - Write contracts with greater flexibility to match customer needs.
 - Stop or actively control the 'give-away' element of service.
 - Adopt an asset-control program on spare parts, idle equipment and test equipment.
- Field service management must establish a marketing function as well as a wider acceptance of field engineering within the corporation.
 - Marketing must be responsible for promoting field service views within the corporation as well as with the client.
 - Field engineers must be a marketing resource, but will need training and development in this area.
 - Marketing must accept the responsibility for maintenance contract renewals and timely collection of revenues.
 - The marketing element of field service must take an active role in presales negotiations to ensure that service provided matches service expected and is profitable to field engineering.

III ANALYSIS OF USER SURVEY

III ANALYSIS OF USER SURVEY

A. METHODOLOGY AND USER PROFILES

- INPUT conducted detailed surveys of three major West European countries:
 - United Kingdom (128 respondents).
 - France (88 respondents).
 - West Germany (90 respondents).
- Two additional regions were also studied, with smaller samples, which will be enlarged in subsequent surveys:
 - Belgium and the Netherlands.
 - Norway and Sweden.
- In spite of the limited size of these samples, INPUT was able to carry out a successful analysis.
 - Readers should nevertheless recognise that the exhibits and comments in the accompanying text in Sections III-E and III-F reflect considerably

smaller samples than those for the three major countries, and that the potential for error increases correspondingly.

- A total of 2,400 questionnaires were mailed to a random cross-section of organisations. Industry sectors covered by those organisations completing the questionnaire include:
 - Discrete and process manufacturing.
 - Services (financial institutions, insurance, research, wholesale, retail, etc.).
 - Educational and medical establishments.
- The selection of companies was also random in terms of organisational size and geographic location within the countries concerned.
- The survey updated a number of topics analysed in the 1978 multiclient study, Maintenance Requirements in the Information Processing Industry, 1978-1983, in particular:
 - Minimum response and repair times.
 - The importance of preventive maintenance.
 - Third-party maintenance.
- In addition, several new issues have been given significant treatment:
 - Remote diagnostics.
 - Software maintenance.
 - Formal escalation procedures.

- The goals of the user analysis are:
 - To explore and expose changing user attitudes which may suggest new business opportunities and ways for client vendors to render present operations more efficient.
 - To strike a reasonable balance among prior issues, new issues and changing attitudes so that all significant trends may be readdressed by this annual report.

B. WESTERN EUROPEAN OVERVIEW

- INPUT's 1980 Field Service User Survey concentrates on the three principal European countries: France, West Germany and the United Kingdom. The data in this section therefore represent facts and opinions mainly of respondent nationals of these countries. The smaller samples from Sweden, Norway, Belgium and the Netherlands have been incorporated, though they will be given deeper treatment in future surveys on this subject.
- In the following analysis, therefore, Europe is treated as a single region. Non-Europeans should nevertheless be fully aware that, politically and economically, this is not the case - despite the Common Market. However, in a purely geographical sense there is justification for combining the total data in one analysis. Country differences, where relevant, are mentioned.
- Attitudes towards third parties, remote diagnostics and escalation procedures receive mixed comments from European users, varying enormously from country to country.
 - Non-users of the above facilities hold quite different views from users as to how, or indeed if, such innovations are going to be of any assistance in raising the level of service.

- Response and repair times received fall short of expectations, although the general quality of maintenance is considered to be high.
- When asked whether the quality of maintenance would improve in the future, the response was as follows:
 - Will improve 46%
 - Will stay the same 41
 - Will decline 13
 - 100%

I. USER PROFILES

- Exhibit III-1 shows that IBM received just under half the total responses for the mainframe area, with 48%.
 - This could be weighted rather heavily by the large U.K. response, where ICL dominated the scene, and so could well be a rather conservative indication of IBM's true position in Europe.
 - ICL and Burroughs were not mentioned at all in Germany, nor was Siemens in the U.K. Honeywell was particularly strong in France.
- Exhibits III-2 through III-5 show the top ten vendors mentioned in each of the following equipment groups:
 - Small business machines/minicomputers.
 - Peripherals, including plug compatible.
 - Terminals.

EXHIBIT III-1

MAINFRAME MAINTENANCE VENDORS
IN WESTERN EUROPE

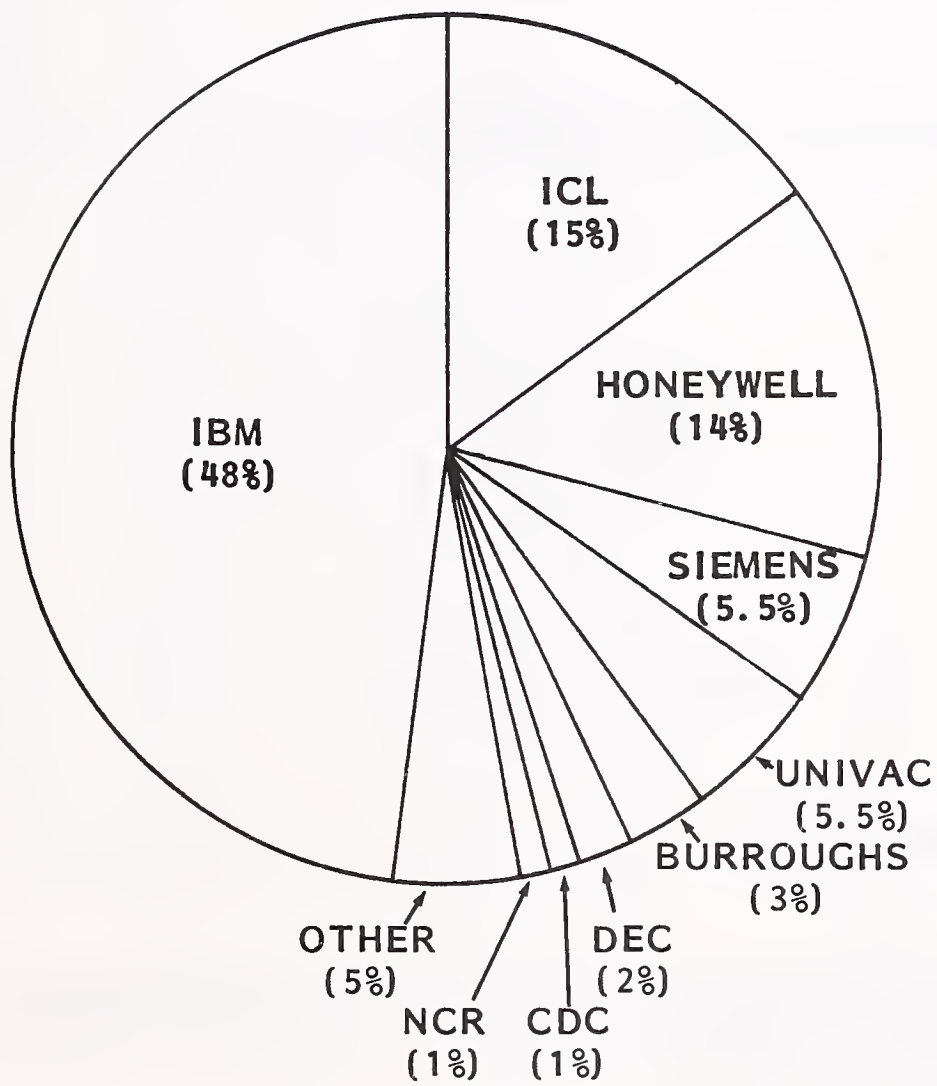


EXHIBIT III-2

TOP TEN INTERNATIONAL SMALL BUSINESS MACHINE / MINICOMPUTER MAINTENANCE VENDORS IN WESTERN EUROPE

POSITION	VENDOR	TOTAL MARKET SHARE (PERCENT)
1	IBM	12.4%
2	DEC	9.0
3	ICL	6.8
4	HONEYWELL	5.6
5	BURROUGHS	4.1
6	NIXDORF	4.1
7	CMC	3.0
8	PHILIPS	3.0
9	HEWLETT-PACKARD	2.3
10	OLIVETTI	2.3
TOTAL		52.6%

NB: ONLY MAJOR, INTERNATIONALLY AVAILABLE EQUIPMENT TAKEN INTO ACCOUNT.

EXHIBIT III-3

TOP TEN INTERNATIONAL PERIPHERAL MAINTENANCE VENDORS IN WESTERN EUROPE

POSITION	VENDOR	TOTAL MARKET SHARE (PERCENT)
1	IBM	25.1%
2	MEMOREX	17.0
3	BASF	10.9
4	CDC	4.1
5	ICL	2.7
6	NCR	2.0
7	DEC	1.4
8	MDS	1.4
9	OLIVETTI	0.7
10	PHILIPS	0.7
TOTAL		66.0%

NB: ONLY MAJOR, INTERNATIONALLY AVAILABLE EQUIPMENT TAKEN INTO ACCOUNT.

EXHIBIT III-4

TOP TEN INTERNATIONAL TERMINAL MAINTENANCE VENDORS IN WESTERN EUROPE

POSITION	VENDOR	TOTAL MARKET SHARE (PERCENT)
1	IBM	24.1%
2	ICL	9.1
3	HONEYWELL	7.7
4	DATASAB	6.2
5	ITT	5.5
6	BURROUGHS	3.6
7	SIEMENS	3.6
8	MEMOREX	3.3
9	UNIVAC	3.3
10	DEC	2.2
TOTAL		68.6%

NB: ONLY MAJOR, INTERNALLY AVAILABLE EQUIPMENT TAKEN INTO ACCOUNT.

EXHIBIT III-5

TOP TEN INTERNATIONAL SYSTEMS SOFTWARE MAINTENANCE VENDORS IN WESTERN EUROPE

POSITION	VENDOR	TOTAL MARKET SHARE (PERCENT)
1	IBM	39.0%
2	ICL	9.8
3	HONEYWELL	7.5
4	BURROUGHS	5.1
5	SIEMENS	3.9
6	UNIVAC	3.5
7	CA	2.4
8	DEC	2.4
9	HEWLETT-PACKARD	1.6
10	CDC	1.1
TOTAL		76.3%

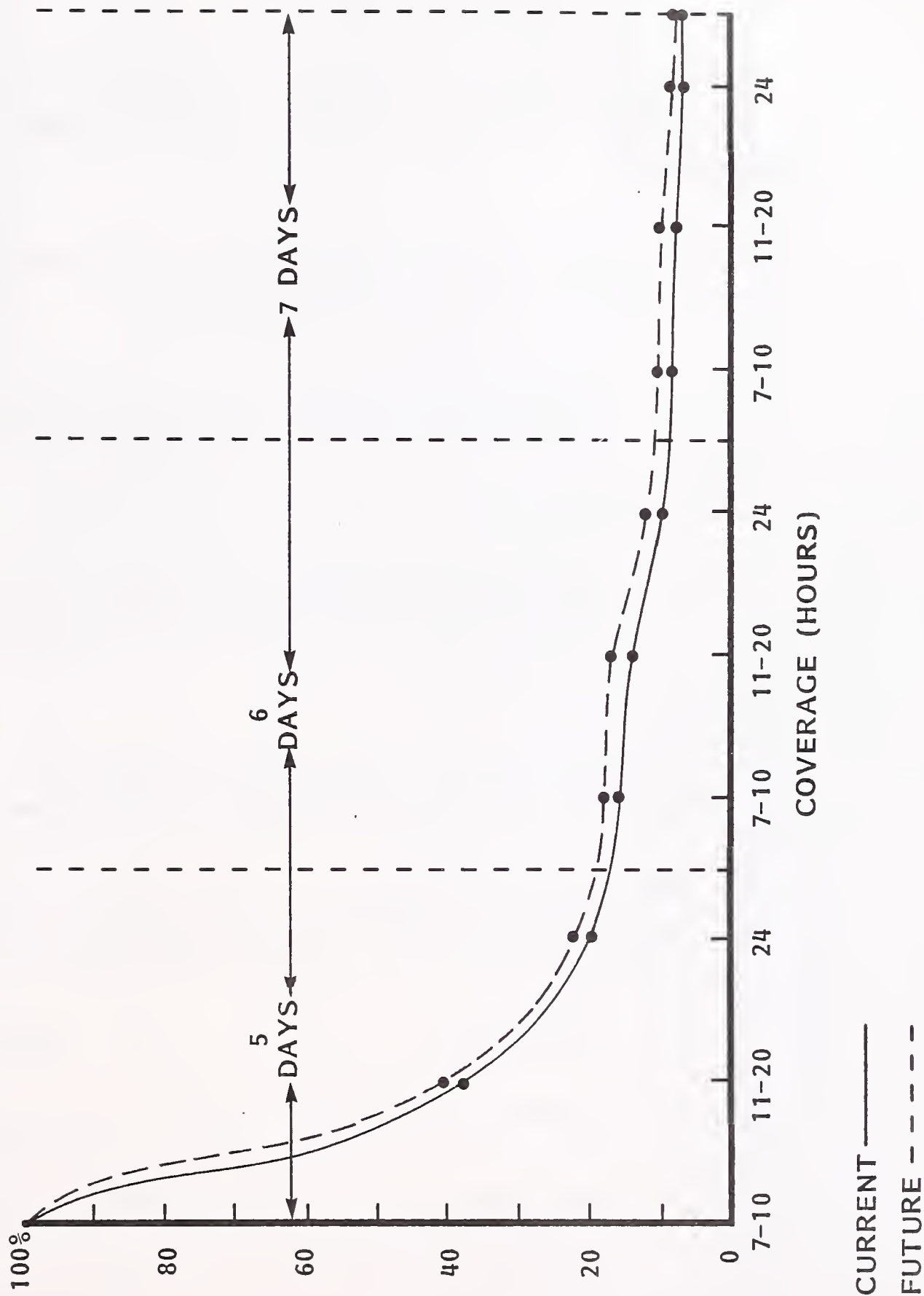
NB: ONLY MAJOR, INTERNATIONALLY AVAILABLE VENDORS TAKEN INTO ACCOUNT.

- Systems software.
- It should be appreciated that only internationally available equipment has been taken into account here.
 - The sample, therefore, has not been biased by any purely domestic vendor of an individual country.
 - IBM tops the list in every case. The total percentage of the top ten always exceeds 50% of the whole market, as viewed by user respondents.
- A similar exhibit concerning applications software is inappropriate, as this is the area where national suppliers tend to dominate; however, IBM's share of this market is still substantial at 19.8%. Burroughs, Honeywell and ICL each hold 4.1%. SAP, although only used in West Germany, is so prevalent there that its share of the total market analysed in Europe is 5%.

2. USERS' ATTITUDES TOWARDS CONTRACTED MAINTENANCE AND COVERAGE

- Nowhere is there any indication of a preference for a time and material basis of payment rather than a maintenance contract. A minimum of 95% of respondent users prefer contract coverage.
- Coverage will not vary much in the future, according to Exhibit III-6. Five-day, 7-10 hours-per-day coverage is currently required by 64% of respondents, and by 61% in the foreseeable future. Additional workloads forecast by many users are counteracted by the current or future use of modern, more reliable equipment and/or duplicate systems.

CURRENT AND FUTURE CUMULATIVE MAINTENANCE COVERAGE
REQUIREMENTS IN WESTERN EUROPE



3. MEAN TIME TO RESPOND AND REPAIR

a. Perceived By Users

- Exhibits III-7 through III-13 are graphical displays of users' minimum acceptable, currently experienced and ideal response and repair times, in a cumulative format.

- For these, and for the corresponding graphs pertaining to the individual countries, the following definitions apply:

- Mean time to respond is the average number of hours between the users' first request for assistance and the engineers' arrival on-site.
- Mean time to repair is the average number of hours from the engineer's arrival until the repair is complete and the machine is running again.

- When added together, mean time to respond and mean time to repair will equal the average total length of machine downtime.

- The analysis is expressed in hours and half-hours. Below is an explanation of how users' specific responses have been interpreted:

- | | | |
|---------------------------|---|----------|
| • 'A half day' | = | 4 hours |
| • 'By the end of the day' | = | 8 hours |
| • 'The same day' | = | 8 hours |
| • 'The next day' | = | 24 hours |
| • 'One day' | = | 24 hours |

MAINFRAME MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR -
MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS
IN WESTERN EUROPE

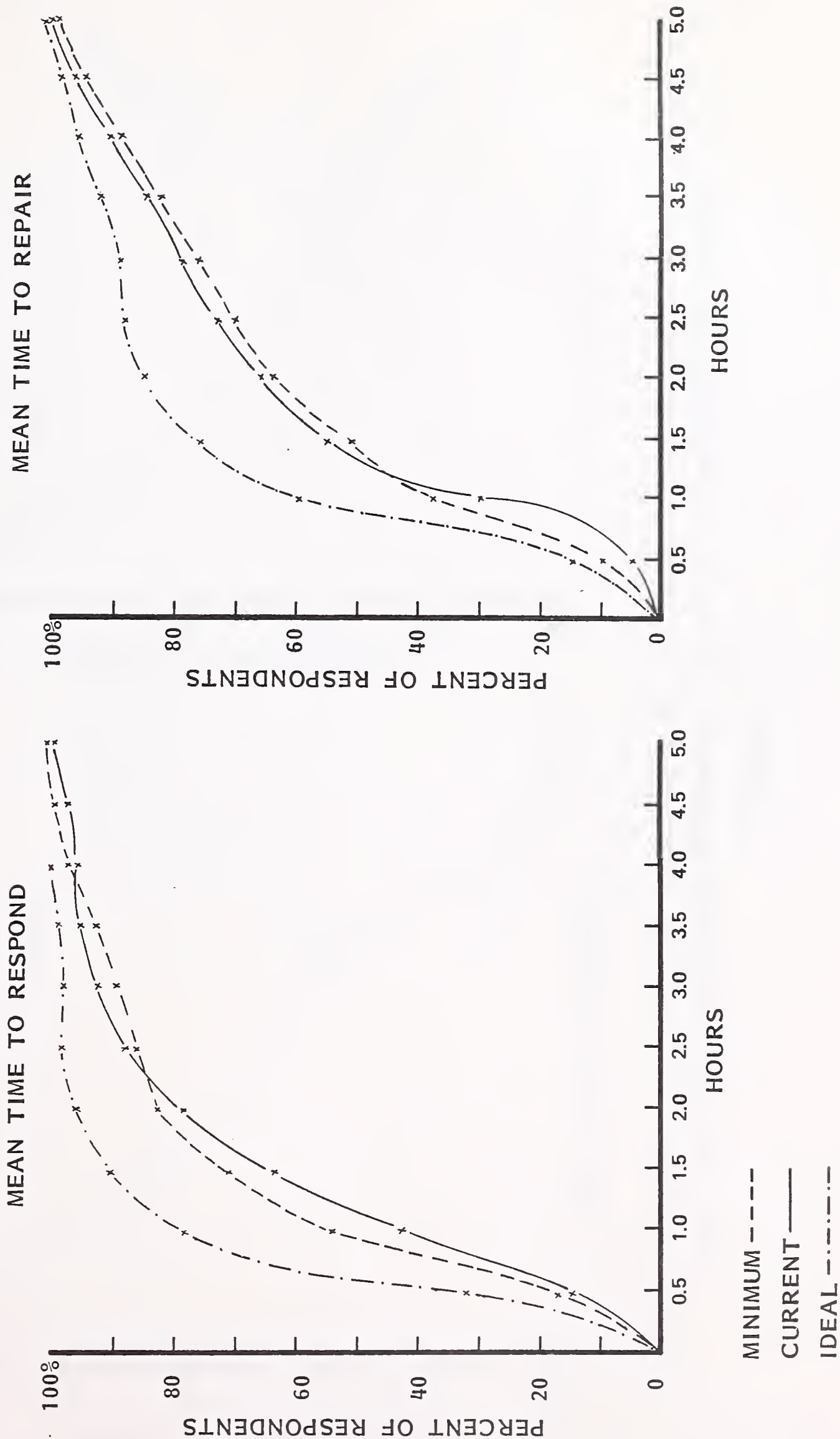


EXHIBIT III-8

SMALL BUSINESS MACHINE MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR - MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN WESTERN EUROPE

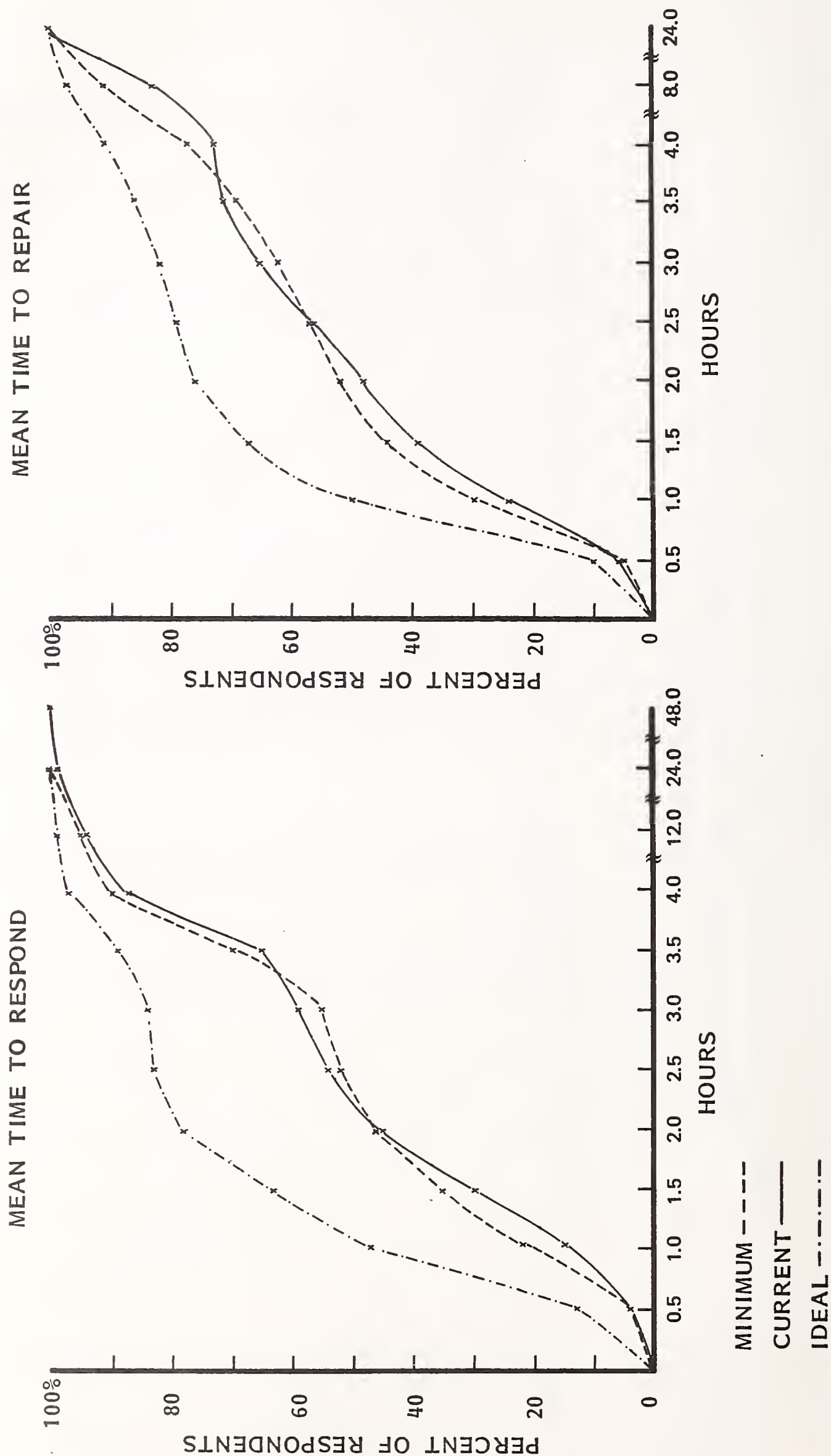


EXHIBIT III-9

MINICOMPUTER MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR - MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN WESTERN EUROPE

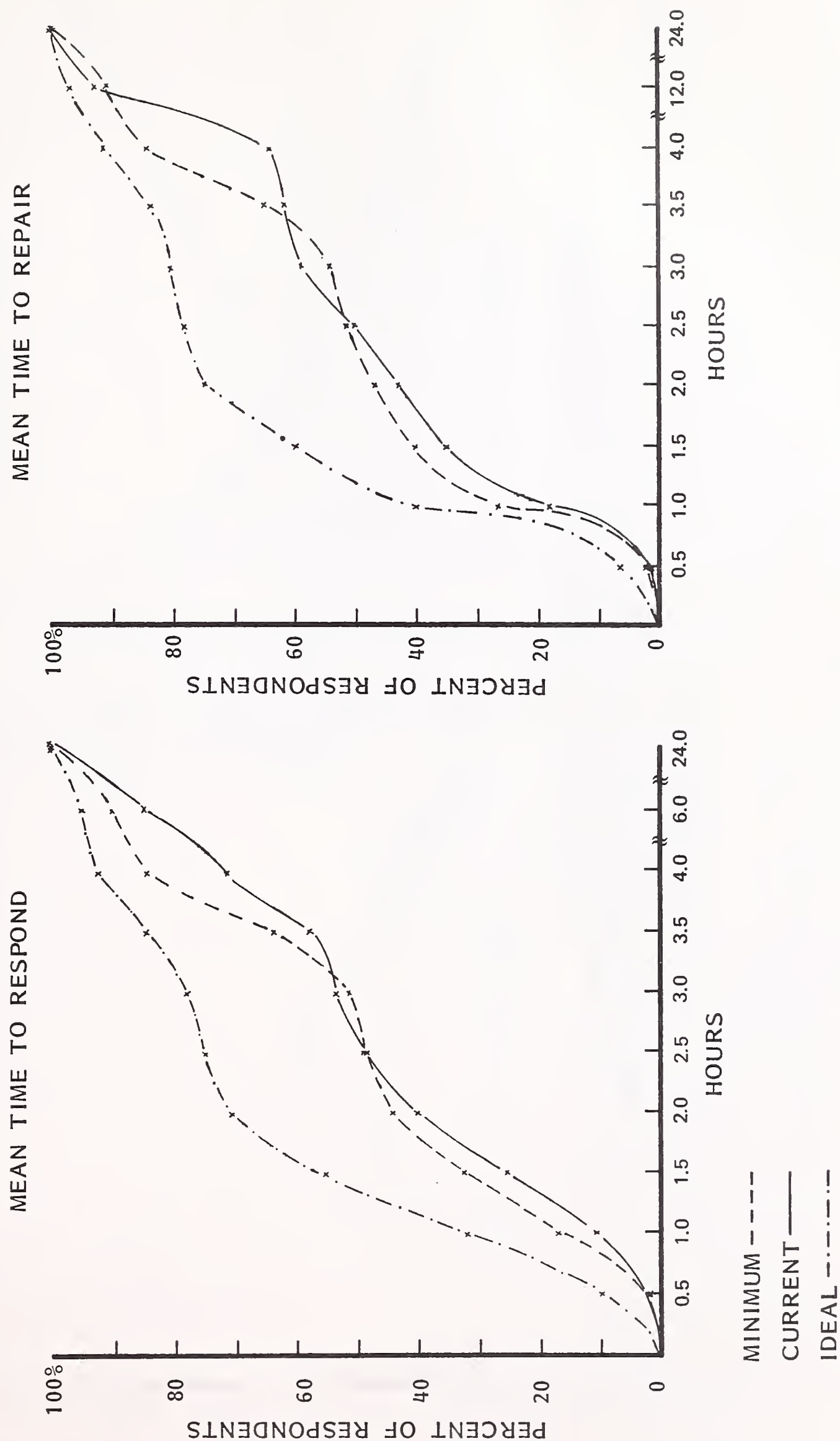


EXHIBIT III-10

PERIPHERAL MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR - MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN WESTERN EUROPE

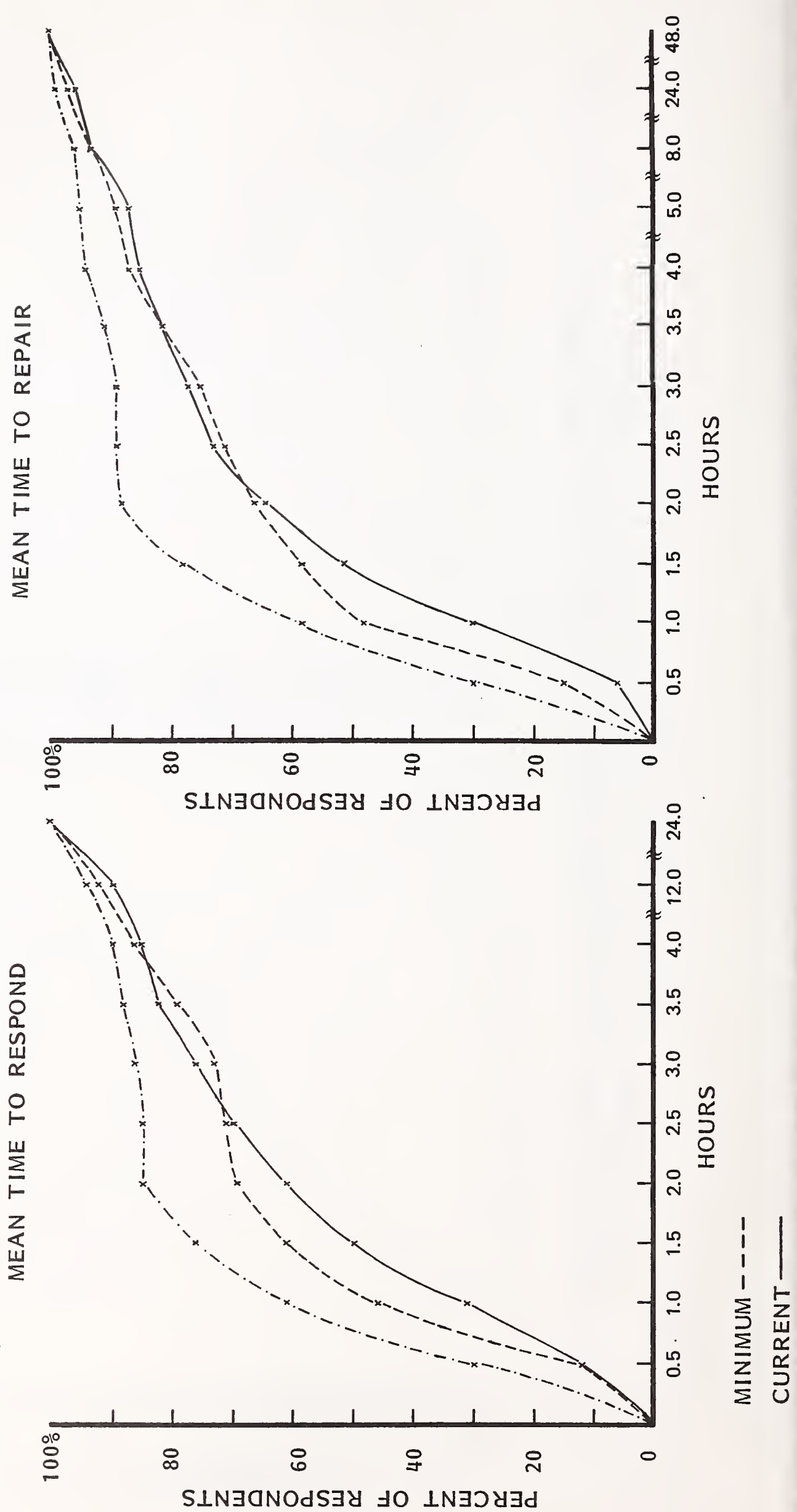
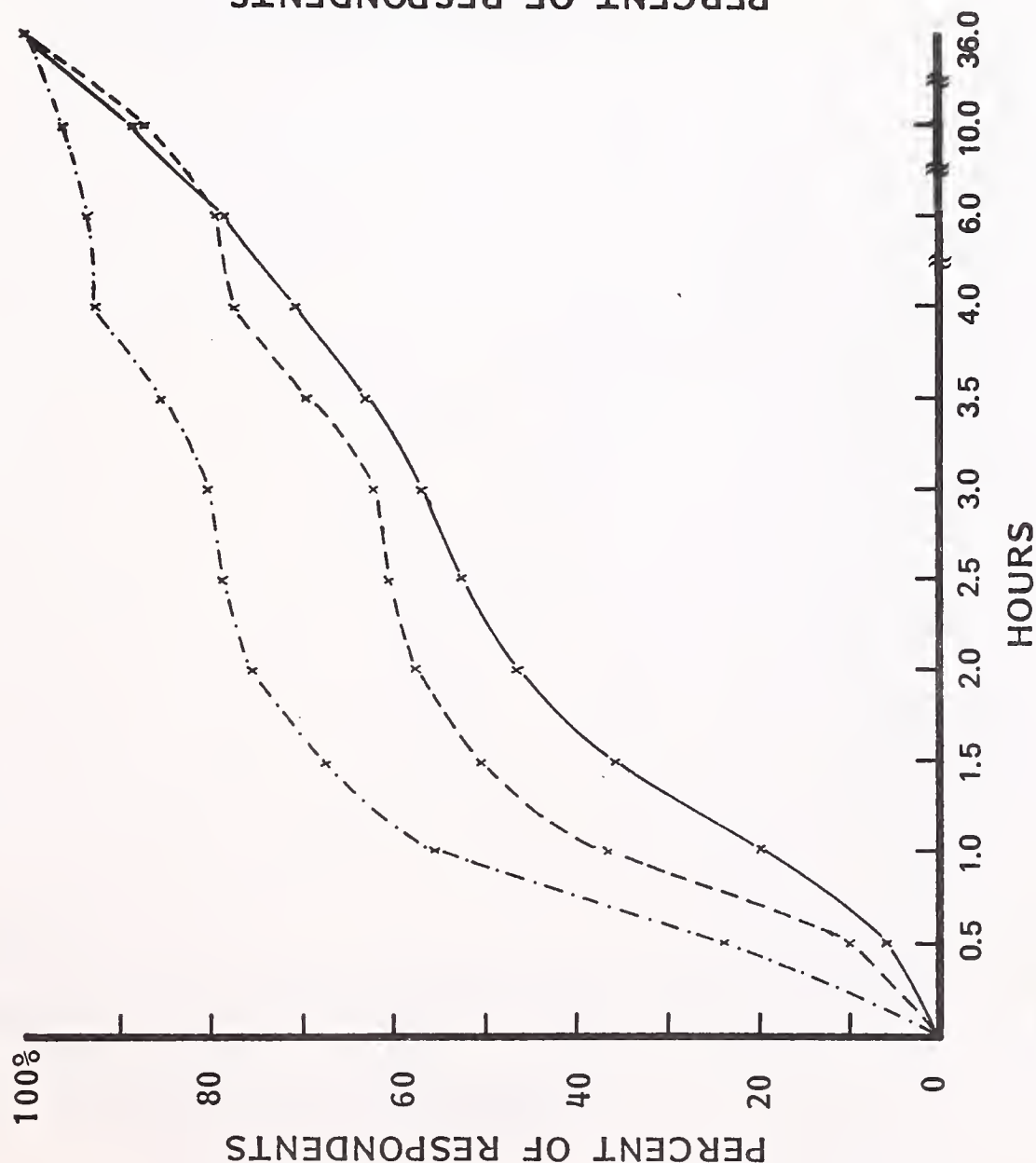


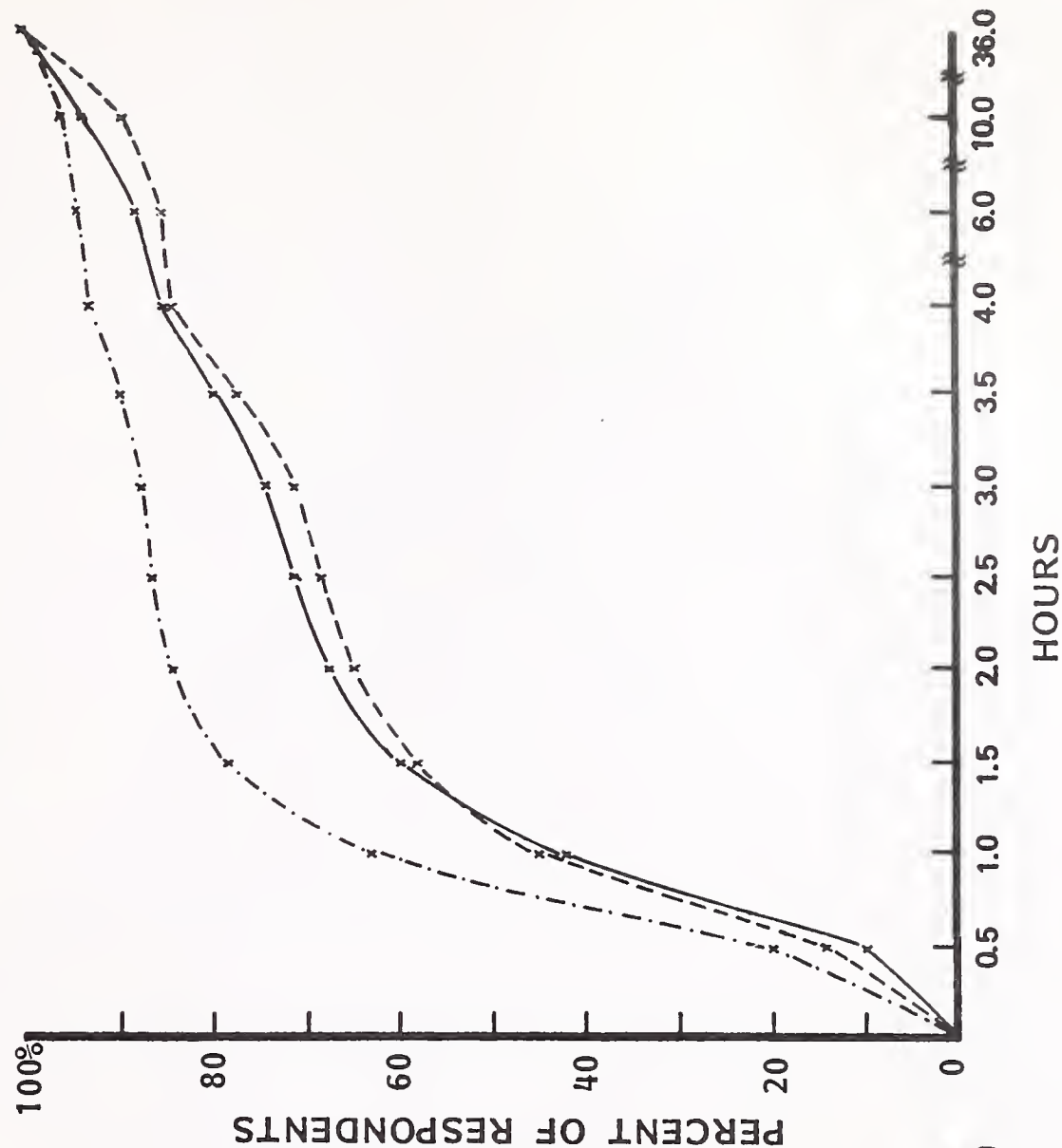
EXHIBIT III-11

TERMINAL MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR -
MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN WESTERN EUROPE

MEAN TIME TO RESPOND



MEAN TIME TO REPAIR

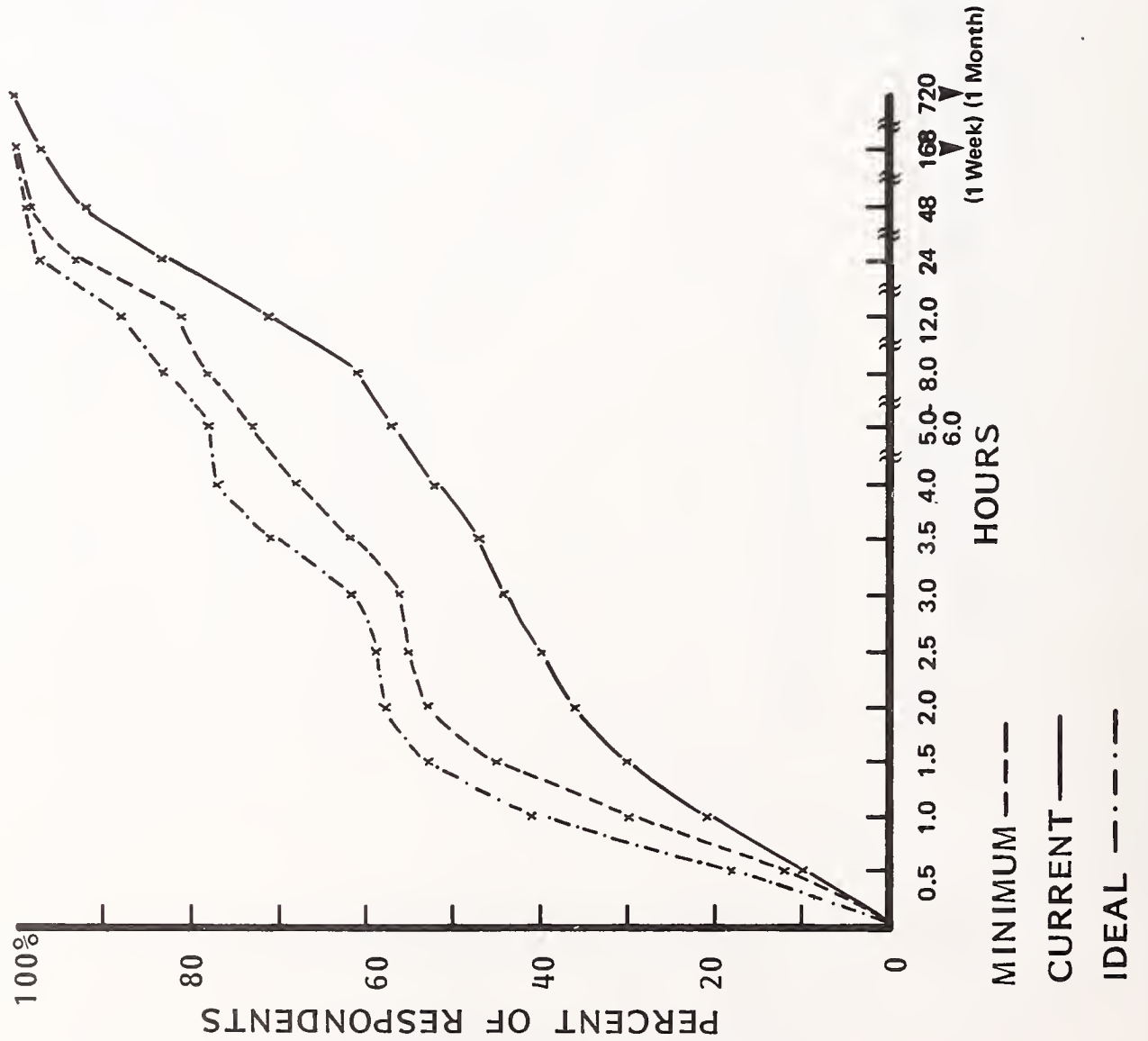


MINIMUM ---
CURRENT —
IDEAL -.-.-

EXHIBIT III-12

SYSTEMS SOFTWARE MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR --
MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN WESTERN EUROPE

MEAN TIME TO RESPOND



MEAN TIME TO REPAIR

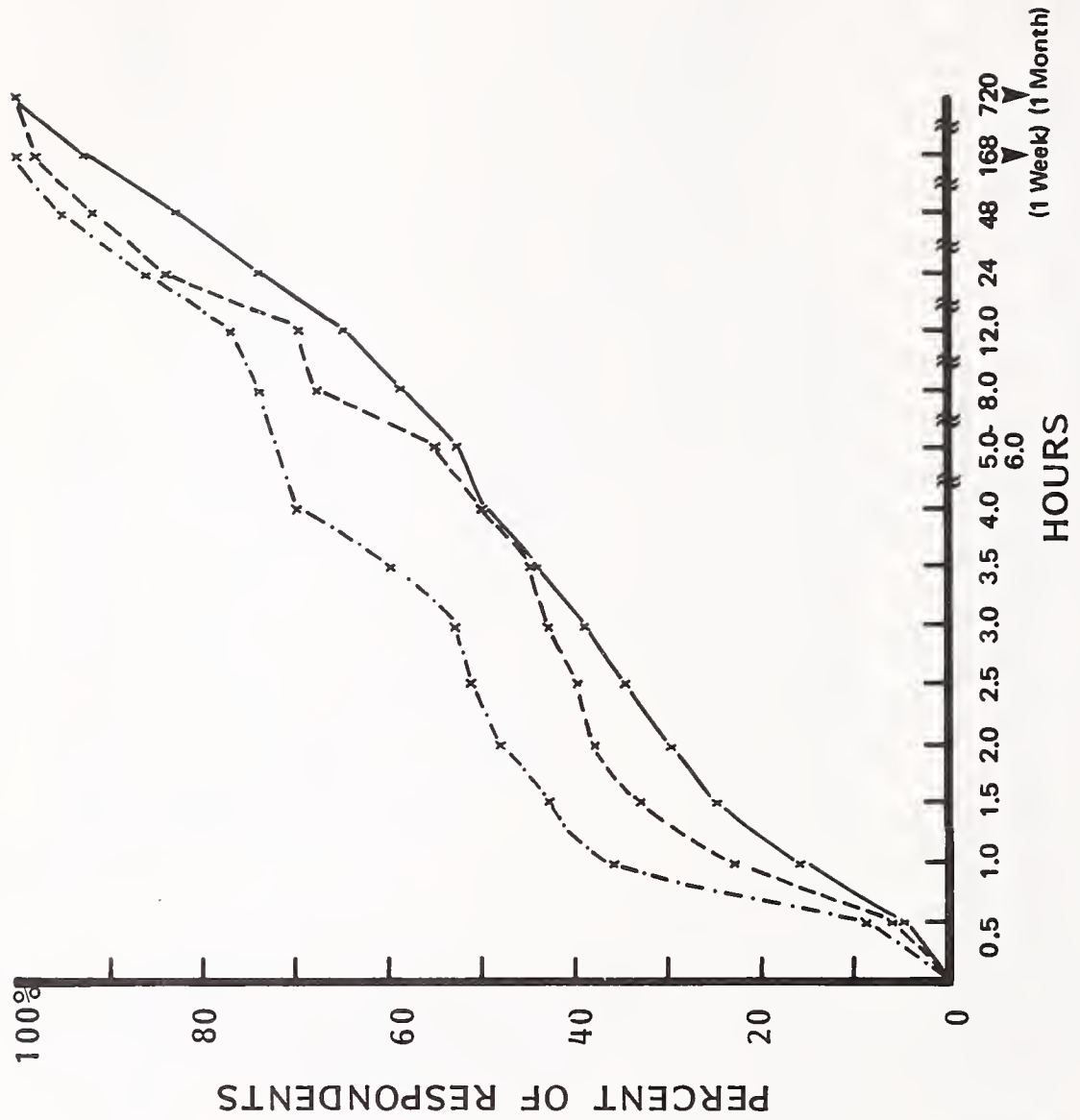
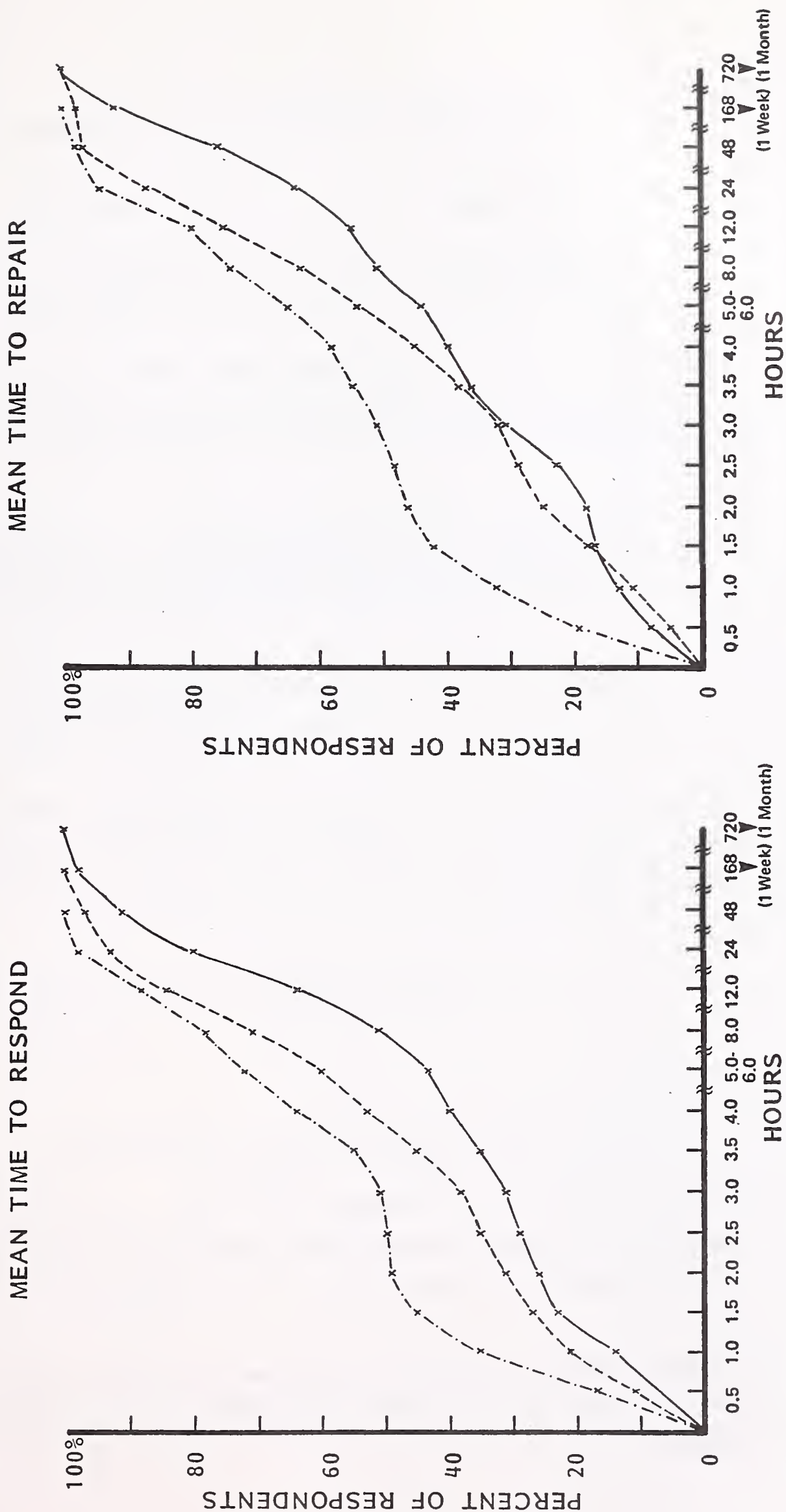


EXHIBIT III-13

APPLICATIONS SOFTWARE MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR - MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN WESTERN EUROPE



.	'Three days'	=	72 hours
.	'One week'	=	168 hours
.	'One month'	=	720 hours

- Some users experience response and repair times that are worse than their minimum requirements. Only in the U.K. does the minimum acceptance curve lie well below the curve representing current performance.
 - For hardware, terminal response time is the area of least satisfaction; elsewhere the minimum acceptance and current levels are virtually the same. In all cases the ideal curve lies well above the other two.
 - Users are also far from satisfied with the response and repair times for both types of software, as shown in Exhibits III-12 and III-13.
- For an improvement in hardware response and repair times, 39% of users would be willing to pay an overall average of 20% extra, ranging from 0.5% to 300%, as shown in Exhibit III-14.
 - Software users would be happy to pay as much as 27% more for a similar improvement in their service, and 44% of users are prepared to do this.

b. Users' Satisfaction With Response and Repair Times

- From Exhibit III-15 it is apparent that more users are dissatisfied than satisfied with response times, and only terminal users show a greater percentage of satisfaction than dissatisfaction with repair times.
- Software users are particularly displeased with repair times received. Of systems and applications software users, 50% and 54% respectively share this opinion.

EXHIBIT III-14

USERS' WILLINGNESS TO PAY MORE FOR IDEAL MAINTENANCE IN WESTERN EUROPE

HARDWARE

CATEGORY	WILLING (PERCENT)	NOT WILLING (PERCENT)	AMOUNT WILLING TO PAY	
			AVERAGE PERCENT	RANGE PERCENT
MAINFRAMES	41%	59%	19%	0.5-100%
SMALL BUSINESS MACHINES	39	61	26	4-300
MINICOMPUTERS	37	63	18	1-100
PERIPHERALS	44	56	19	1-100
TERMINALS	36	64	17	2-100
TOTAL	39%	61%	20%	0.5-300%

SOFTWARE

CATEGORY	WILLING (PERCENT)	NOT WILLING PERCENT	AMOUNT WILLING TO PAY	
			AVERAGE PERCENT	RANGE PERCENT
SYSTEMS SOFTWARE	43%	57%	28%	5-100%
APPLICATIONS SOFTWARE	43	57	26	5-100
TOTAL	44%	56%	27%	5-100%

EXHIBIT III-15

USERS' SATISFACTION/DISSATISFACTION WITH THEIR MAINTENANCE SERVICE IN WESTERN EUROPE

RESPONSE TIMES

EQUIPMENT TYPE	SATISFIED*		NOT SATISFIED**	
	NUMBER	PERCENT	NUMBER	PERCENT
MAINFRAMES	79	29%	95	35%
SMALL BUSINESS MACHINES	31	22	64	47
MINICOMPUTERS	29	28	39	38
PERIPHERALS	38	31	53	44
TERMINALS	72	30	98	41
SYSTEMS SOFTWARE	47	32	69	47
APPLICATIONS SOFTWARE	23	28	33	40

REPAIR TIMES

EQUIPMENT TYPE	SATISFIED*		NOT SATISFIED**	
	NUMBER	PERCENT	NUMBER	PERCENT
MAINFRAMES	82	32%	93	36%
SMALL BUSINESS MACHINES	46	34	51	38
MINICOMPUTERS	32	33	36	37
PERIPHERALS	36	32	50	44
TERMINALS	109	49	81	36
SYSTEMS SOFTWARE	33	24	70	50
APPLICATIONS SOFTWARE	15	21	41	54

*SATISFIED = RESPONDENTS CURRENTLY ATTAINING, OR IMPROVING ON, THEIR IDEALS.

**NOT SATISFIED = RESPONDENTS WHOSE CURRENT AVERAGE FALLS BELOW THEIR MINIMUM ACCEPTABLE LEVEL OF SERVICE.

- It should be appreciated that the 'satisfied' and 'dissatisfied' each represent a total view, and therefore will not add to 100%. The 'satisfied' column refers to respondents who are achieving their ideal, whilst 'dissatisfied' indicates users whose current average falls below their minimum level of service.

4. USERS' SATISFACTION WITH MAINTENANCE

- Once the engineer has completed his work, users are generally satisfied with the quality of the repair, as is borne out by Exhibit III-16.
 - Satisfaction levels are again lowest among software users, where 22% and 23% awarded their vendors low marks.
 - Mainframe users are receiving the best quality, with 70% of respondents allocating high ratings. As this is often regarded as the most critical piece of DP equipment, vendors are right to concentrate their best efforts in this area.
- Exhibits III-17 and III-18 show ratings of vendors, on a scale of 1 to 5, by respondent users in the U.K., France and Germany individually, for both hardware and software.
 - For hardware, ICL received higher ratings in France (3.6) than in its home market, the U.K. (3.3), but low marks in Germany (2.2).
 - NCR's rating is rated very poorly in the U.K. (1.2), but considerably higher in France and Germany (4.0 in each).
- CDC, IBM and, to a lesser extent, DEC are consistently highly rated. Memorex and Philips receive similar marks from each region.
 - NCR as a software vendor rates low (2.0) in Britain and was not even mentioned in France or Germany.

EXHIBIT III-16

USERS' GENERAL SATISFACTION WITH MAINTENANCE IN WESTERN EUROPE

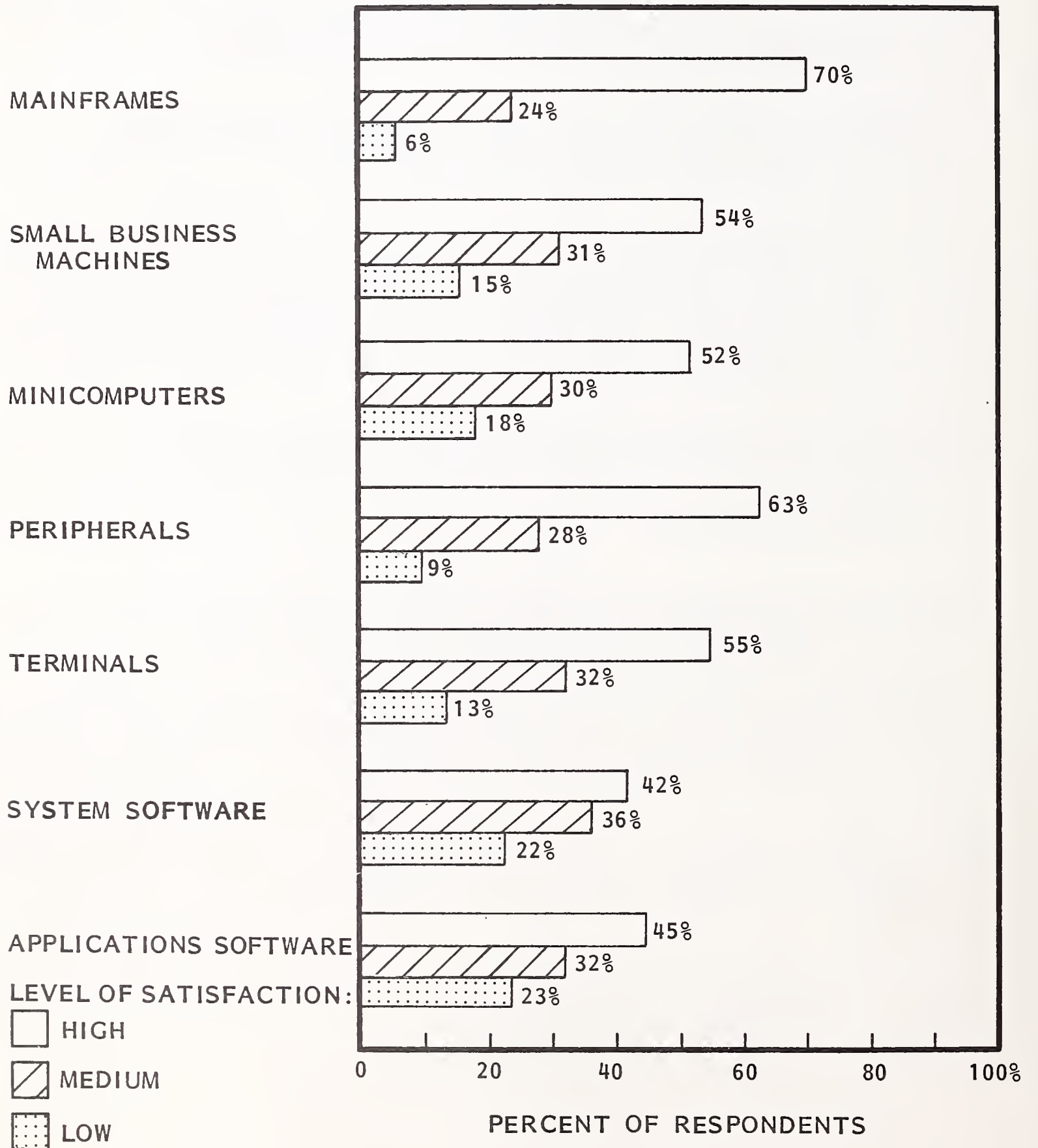


EXHIBIT III-17

USERS' RATINGS OF HARDWARE MAINTENANCE VENDORS:
UNITED KINGDOM, FRANCE AND WEST GERMANY

VENDOR	AVERAGE RATINGS		
	UNITED KINGDOM	FRANCE	WEST GERMANY
BASF	-	3.58	4.08
BURROUGHS	3.40	3.17	-
CDC	4.25	4.50	3.71
CMC	4.25	3.67	-
DATA GENERAL	3.43	-	-
DATASAB	-	4.00	2.00
DEC	3.69	3.50	3.75
HEWLETT-PACKARD	3.69	4.00	3.25
HONEYWELL	3.75	3.10	2.75
IBM	3.82	3.99	3.70
ICL	3.34	3.56	2.20
ITT	3.00	3.20	3.11
MDS	-	3.80	3.17
MEMOREX	3.50	3.58	3.00
NCR	1.20	4.00	4.00
NIXDORF	-	-	3.13
PHILIPS	3.50	3.50	3.00
PRIME	2.50	3.00	-
SIEMENS	-	4.20	3.52
TEXAS INSTRUMENTS	3.00	3.00	2.67
UNIVAC	3.40	-	3.27

RATING: 5 = HIGH, 1 = LOW

EXHIBIT III-18

USERS' RATINGS OF SOFTWARE
MAINTENANCE VENDORS IN
WESTERN EUROPE

VENDOR	AVERAGE RATINGS		
	UNITED KINGDOM	FRANCE	GERMANY
BURROUGHS	3.06	3.00	-
CDC	3.00	-	4.00
DEC	2.92	-	-
HEWLETT-PACKARD	3.00	-	-
HONEYWELL	3.00	3.41	-
IBM	3.26	3.51	3.17
ICL	3.62	3.10	-
NCR	2.00	-	-
PHILIPS	-	4.50	-
SIEMENS	-	-	3.29
UNIVAC	2.75	-	2.80

- Univac as a vendor of software received low marks in both the U.K. and Germany (both 2.8).
- When maintenance has been poor, users are ready and willing to replace equipment - especially peripherals, as can be seen in Exhibit III-19.
 - Mainframes are very infrequently replaced as a result of poor maintenance. It is interesting to note here that, despite its dominance of the hardware scene, only one IBM mainframe user replaced this equipment as a result of poor maintenance.
 - As a software vendor, IBM was replaced five times because of a low maintenance quality, according to Exhibit III-20.

5. USERS' SATISFACTION WITH PERSONNEL AND PROCEDURES

- Respondent users were somewhat critical of changes in the quality of field service engineers and how they are managed.
 - Exhibit III-21 gives the percentages of respondents who considered that these standards had remained the same, had improved or had degraded.
 - The main problem is getting skilled, competent engineers to stay in their jobs. This has been overcome in Germany, but elsewhere it is a real difficulty.
 - Staff shortages are another concern, as is a lack of properly trained engineers. Company expansion has been blamed for this. Users of older equipment felt particularly left out, as engineers servicing this equipment do not appear to be replaced when they leave their companies.
 - After Rank Xerox's computing interests were bought by Honeywell, the quality of engineers declined. Many left and joined other vendor organisations.

EXHIBIT III-19

HARDWARE REPLACED DUE TO POOR MAINTENANCE IN WESTERN EUROPE

MAINFRAMES	SMALL BUSINESS SYSTEM MINICOMPUTERS	PERIPHERALS	TERMINALS
IBM	BURROUGHS (x3)	BASF (x4)	BURROUGHS
UNIVAC	DATA GENERAL	ICL (x3)	CASE
	FEEDBACK DATA	BURROUGHS	DATA DYNAMICS
	ICL	CDC	ICL
	OLIVETTI	HONEYWELL	ITT
	PHILIPS	IBM	LOGICA
	SEMS	MDS	MDS
	SYSTIME	OLIVETTI	OLIVETTI
		POTTER	TEXAS INSTRUMENTS
		SMS	
		STC	

EXHIBIT III-20

SOFTWARE VENDORS REPLACED
DUE TO POOR MAINTENANCE
IN WESTERN EUROPE

VENDOR	NUMBER OF RESPONDENTS
IBM	5
HONEYWELL	3
ICL	2
BURROUGHS	1
DEC	1
PHILIPS	1
SYSTIME	1
UNIVAC	1
OTHER	4

EXHIBIT III-21

CHANGES IN THE QUALITY OF FIELD SERVICE
ENGINEERS AND FIRST-LINE MANAGERS
IN WESTERN EUROPE

OPINION	FIELD ENGINEERS (PERCENT)	FIRST-LINE MANAGERS (PERCENT)
SAME	55%	62%
BETTER	23	21
POORER	22	17

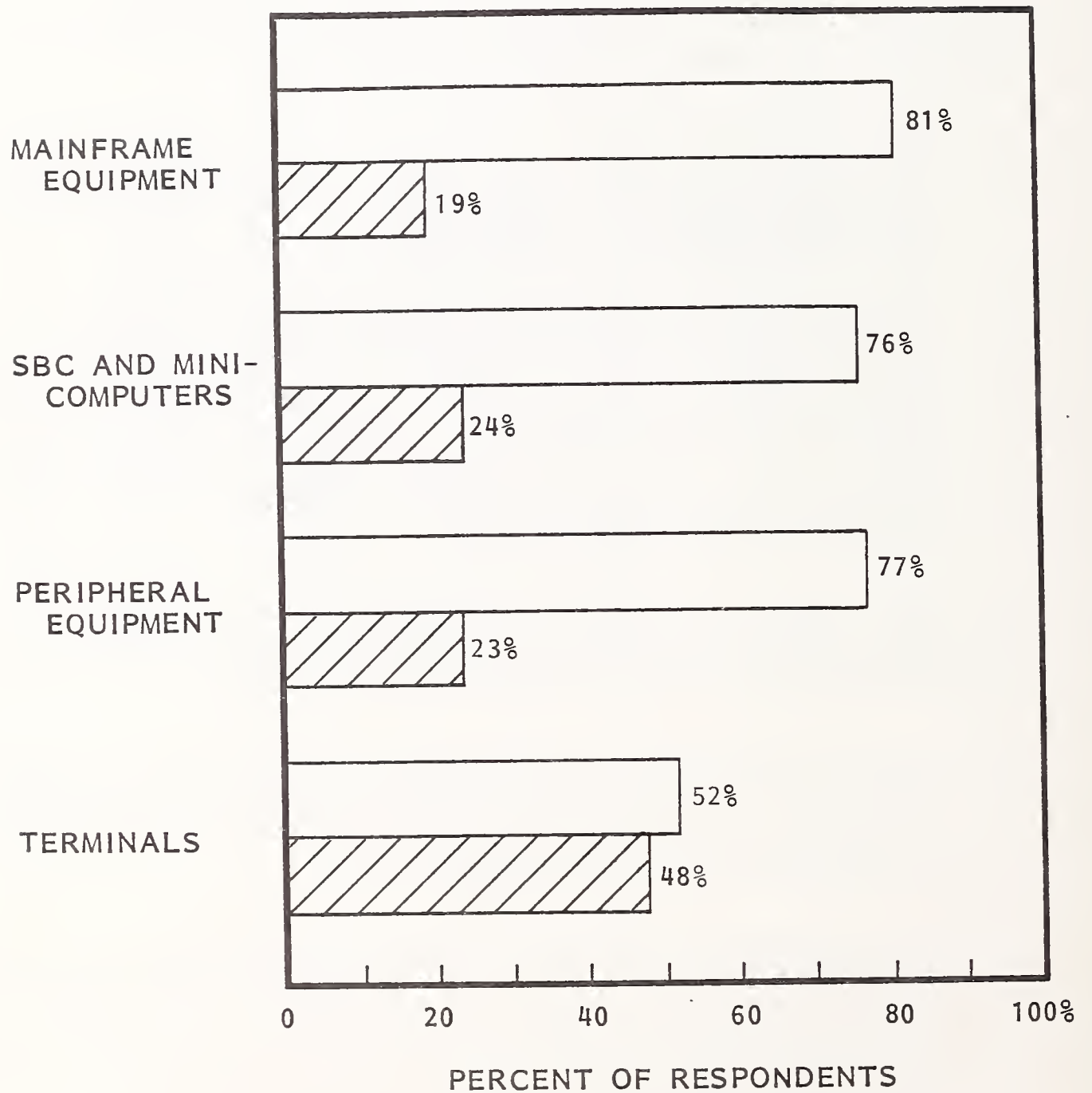
- Organisational restructuring was blamed for a decline in the management of engineers, in several cases. However, only 17% of the respondents overall considered the quality of engineers' first-line managers to have worsened.

6. USERS' ATTITUDES AND CONCERNS ABOUT UNBUNDLING MAINTENANCE

- Users voted overwhelmingly in favour of a fixed pricing structure rather than an incremental structure, as expressed in Exhibit III-22.
 - The exception to this was terminals, where opinions were divided almost down the middle: 52% preferred a fixed pricing structure, and 48% favoured an incremental charge.
 - Convenience and ease of budgeting were the overriding factors governing these decisions, with the age of equipment models, how critical their use was, and whether or not there were duplicate systems all playing a part. Older, critical and non-duplicated equipment promoted a decision in favour of fixed price.
- Users were asked how they felt about performing certain maintenance tasks themselves, and the results are tabulated in Exhibit III-23.
 - Only the performance of diagnostics by users was really preferred by a significant number; 37% of users were already doing this, and 17% of those who were not, would consider doing so.
 - Least popular was the idea of taking one's own equipment to the vendor depot to be repaired. Only 8% are carrying this out, and 6% of the remainder would be prepared to consider this since this is a relatively new concept and primarily applicable to small equipment.

EXHIBIT III-22

UNBUNDLING OF MAINTENANCE BY
EQUIPMENT TYPE IN
WESTERN EUROPE



- ☐ USERS IN FAVOUR OF A FIXED PRICING STRUCTURE
- ☒ USERS IN FAVOUR OF AN INCREMENTAL PRICING STRUCTURE

**USERS' WILLINGNESS TO PERFORM MAINTENANCE ACTIVITIES
IN WESTERN EUROPE**

TYPE OF USER	INSTALL EQUIPMENT	PERFORM DIAGNOSTICS	MAINTAIN HARDWARE	MAINTAIN SOFTWARE	USE DEPOT MAINTENANCE
CURRENTLY PERFORMING	12%	37%	9%	24%	8%
NOT CURRENTLY PERFORMING	88	63	91	76	92
AVERAGE PERCENT SAVINGS	20	9	16	21	33
NOT CURRENTLY PERFORMING -WOULD CONSIDER	3	17	6	12.5	6
WOULD NOT CONSIDER	97	83	94	87.5	94
ANTICIPATED PERCENT SAVINGS (AVERAGE)	30	11	5	28	15

7. USERS' ATTITUDES TOWARDS THIRD-PARTY MAINTENANCE

- Third parties are not prevalent in Europe, and several respondents are not aware of the existence of any in their areas. Only in the U.K. were any third-party users found.
 - From Exhibit III-24 it is apparent that so long as a good relationship exists between users and vendors, the users will not look elsewhere to have their equipment serviced.
 - It is also a general opinion that the manufacturer of the devices is the only organisation virtually guaranteed to have both fully trained staff on updated equipment and the necessary spares.

8. USERS' SENSITIVITY TOWARDS MAINTENANCE PRICING

- In the U.K. and France, users' sensitivity to maintenance pricing is a subject of considerable concern, although not a great deal can be done to counter it. In Germany the problem is no greater than users either expect or can afford, although if it does become a problem in Germany, users there will react more than their more complacent French and British counterparts.
 - Fewer respondents in Germany registered an increase in price than elsewhere, and the average was less than in the other countries.

9. USERS' ATTITUDES TOWARDS ELIMINATING PREVENTIVE MAINTENANCE

- Users would definitely prefer not to eliminate preventive maintenance. However, mean time to respond, closely followed by mean time to repair, is considered a more important characteristic of maintenance, as shown in Exhibit III-25.

EXHIBIT III-24

THIRD-PARTY MAINTENANCE IN WESTERN EUROPE:
NON-USERS' PERCEPTIONS AND REASONS FOR NOT CONSIDERING

FACTOR	PERCENT
CURRENTLY RECEIVE SATISFACTORY SERVICE/GOOD RELATIONSHIP	30.4%
MANUFACTURER HAS EXPERIENCE AND IS UP TO DATE ON OWN EQUIPMENT	14.4
COMMUNICATIONS DIFFICULTIES/CONFLICTS IN RESPONSIBILITY	12.8
SECURITY	8.8
MANUFACTURER'S RESPONSIBILITY ALONE	8.0
LEGALLY IMPOSSIBLE (CONTRACT, ETC.)	8.0
NOT KNOWN TO BE AVAILABLE LOCALLY	7.2
POTENTIAL PROBLEMS WITH SPARES	6.4
BAD EXPERIENCE IN THE PAST	2.4
MORE EXPENSIVE	1.6

EXHIBIT III-25

IMPORTANCE OF FIELD MAINTENANCE
CHARACTERISTICS - USERS' RATINGS
IN WESTERN EUROPE

FACTOR	PERCENT HIGH RATINGS	AVERAGE RATING
MEAN TIME TO RESPOND	87%	4.4
MEAN TIME TO REPAIR	86	4.3
PREVENTIVE MAINTENANCE	46	3.3

*RATED ON A SCALE OF 1 TO 5, WHERE 1 = LOW, 5 = HIGH.

10. USERS' ATTITUDES TOWARDS REMOTE DIAGNOSTICS

- Nearly half of remote diagnostics users felt the quality of their service had improved as a result:

-	Same standards	39%
-	Better standards	46
-	Poorer standards	<u>15</u>
		100%
- A small number of users did not give an opinion as the system was too recent for them to have sufficient experience in its use.

II. USERS' PERCEPTIONS OF ESCALATION PROCEDURES

- Exhibit III-26 shows existing and potential users' views of how escalation procedures do or would improve their service.
 - Only in France was there little enthusiasm, with 80% feeling there had been no change in quality.
 - Elsewhere and overall, a high percentage consider there has been an improvement in the standard.
- Those without this facility gave their views of whether the standard would be improved or not. Percentages were much lower for those who think it would improve their service.

EXHIBIT III-26

USERS' SATISFACTION LEVELS WITH ESCALATION PROCEDURES
(ACTUAL AND AS PERCEIVED BY RESPONDENTS WITHOUT THIS FACILITY)
IN WESTERN EUROPE

COMMENT	UNITED KINGDOM		FRANCE		GERMANY		BELGIUM / NETHERLANDS		NORWAY / SWEDEN		TOTAL WESTERN EUROPE	
	WITH	WITH-OUT	WITH	WITH-OUT	WITH	WITH-OUT	WITH	WITH-OUT	WITH	WITH-OUT	WITH	WITH-OUT
IMPROVED	89%	24%	20%	22%	90%	16%	ND	40%	100%	21%	82%	21%
SAME	10	76	80	78	0	84	ND	60	0	79	15	79
POORER	1		0		10		ND		0		2	

ND = NO DATA

12. EFFECTIVENESS OF NEW MAINTENANCE TECHNIQUES INTRODUCED BY VENDORS

- The most effective new maintenance techniques included the following:
 - On-site senior problem manager.
 - More built-in diagnostics and fault recording.
 - Setting up new response centres, giving engineers full details of clients' sites and recording fault details.
 - Centralisation of telephone calls.
 - More back-up equipment.
 - IBM Retain System.
 - IBM Central Maintenance Service.
 - Changing rather than repairing defective boards.
 - More spares held on-site.

13. USERS' COMMENTS ON MAINTENANCE IMPROVEMENT

- Users stated they would like to see the following additional improvements made:
 - 'Engineers who are better trained and well equipped.'
 - 'Improved spares holdings.'
 - 'Better software maintenance.'

- 'Improved diagnostics.'
- 'Remote diagnostics.'
- 'Immediate contact with a qualified person when calling vendors.'
- 'Better response and repair times.'
- 'Software specialists.'
- 'Better interaction in fault diagnosis between hardware and software.'
- 'Specialist engineers rather than general engineers.'
- 'On-site engineers.'

C. USER RESPONSES: UNITED KINGDOM

I. VENDOR PROFILES

- The continuing trend for users to acquire equipment from a variety of sources gives rise to opportunities for single-source problem determination and maintenance coordination contracts. However, as users become more proficient at problem determination within their own organisations, such opportunities may soon be on the decline.
- The trend to multivendor shops was evidenced by user responses. Asked to identify maintenance vendors in five separate hardware categories and two software categories, respondent users named 57 different hardware vendors and 37 vendors in software maintenance.

- In some instances the five hardware categories were reduced to four by combining 'small business systems' and 'minicomputers'.
- The hardware and software maintenance vendors mentioned by respondents are presented in detail in Appendix B. The mainframe vendors are listed in Exhibit III-27.
- It is important to appreciate that a 6% count for Honeywell does not imply that Honeywell enjoys a 6% share of the terminal market, but rather that Honeywell was mentioned in 6% of the responses to the question, 'Which vendors maintain your terminals?'.
- ICL and IBM are the dominant vendors in the mainframe sector, the rest falling far behind. The market for small business systems/minicomputers is more evenly distributed, although DEC emerges with a clear lead of 14% over its nearest competition, ICL with 10% and IBM with 9%.
- Memorex received the largest number of mentions under 'plug compatible peripherals', and again, apart from IBM with 16%, the market split is fairly evenly distributed over a large number of suppliers.
- No fewer than 32 different terminal vendors were mentioned out of a total of 100 responses to this question. These were divided almost equally between mainframe and non-mainframe vendors, with ICL and IBM again the dominant vendors.
- The first four market leaders are the same and in the same order, for software systems as for medium to large mainframes. This is hardly surprising, although there were an extra 16 different vendors mentioned for software maintenance.
- Sixty percent of the mentions for applications software were non-mainframe vendors. This is a market area that is being aggressively pursued by many small computer services companies.

EXHIBIT III-27

MAINFRAME MAINTENANCE VENDORS IN THE UNITED KINGDOM

VENDOR	PERCENTAGE OF RESPON- DENTS
ICL	38%
IBM	28
BURROUGHS	9
HONEYWELL	9
UNIVAC	6
DEC	5
CDC	2
NCR	2
HEWLETT-PACKARD	1

2. USERS' ATTITUDES CONCERNING MAINTENANCE AND COVERAGE

- Respondent users show no significant tendency to migrate from contract maintenance to time and materials, as shown in Exhibit III-28. Out of 454 responses concerning which vendor maintains which equipment, only 21 were for time and materials contracts, a total of 5%.
 - This 5% resulted largely from software maintenance vendors, who run very little risk of catastrophic failure.
 - Microcomputers, which are mostly integrated into larger systems, make up most of the remainder.
- The most likely migration to time and materials will occur in the cases of minicomputers, terminals and/or small business systems, which can be easily transported to maintenance or exchange centres.
 - Few users appear willing to assume the risk of a catastrophic maintenance expense.
 - There continues to be general acceptance of the fact that hardware maintenance contracts are good insurance policies for assuring reliability and high residual value of used equipment.
- Exhibit III-29 shows that 18% of respondent users are receiving six- to seven-day coverage, with a further 8% requiring 24-hour coverage five days a week, rising to 16% receiving 11-20 hours and 58% receiving 7-10 hours of coverage, five days a week.
- Users showed a slight trend towards greater coverage, particularly on weekends.

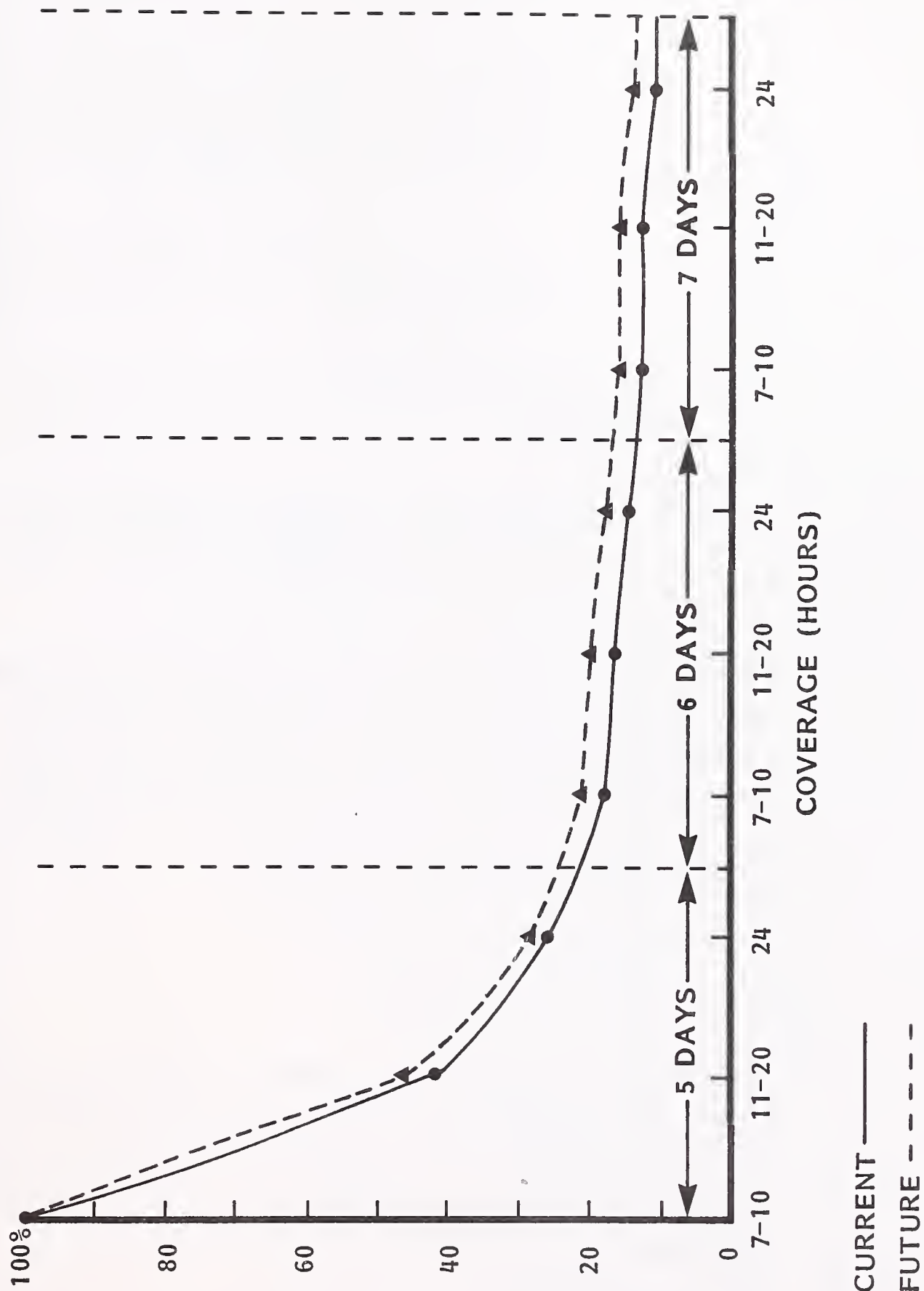
EXHIBIT III-28

MAINTENANCE CONTRACT VERSUS TIME AND MATERIALS USAGE IN THE UNITED KINGDOM

CATEGORY	CONTRACT		TIME & MATERIALS	
	NUMBER	PERCENT	NUMBER	PERCENT
MAINFRAMES	87	99%	1	1%
SMALL BUSINESS COMPUTERS	61	98	1	2
MINICOMPUTERS	48	94	3	6
PERIPHERALS	30	94	2	6
TERMINALS	102	96	4	4
SYSTEMS SOFTWARE	71	95	4	5
APPLICATIONS SOFTWARE	34	85	6	15
TOTAL	433	95%	21	5%

EXHIBIT III-29

CUMULATIVE MAINTENANCE COVERAGE REQUIREMENTS IN THE UNITED KINGDOM: CURRENT AND FUTURE



- As expected, reasons for increased future coverage were governed by an anticipated growth in use of distributed processing and/or an increased workload:
 - . 'We run a distributed processing system. Its use is now extending over the normal working day. We will have to increase coverage, from eight hours per weekday, soon.'
 - . 'A review of contracted maintenance will be necessary as our workload expands.'
- Less future coverage may result from the greater reliability of newer equipments.
 - . 'Reduction in coverage from 16 hours to 10 hours this year with a change in configuration.'
- Outside normal hours, respondents generally prefer to book extra coverage or pay on a time and materials basis rather than wait. Only nine out of 123 respondents wished to wait till the following day in the case of failure. Other solutions were to use an alternate machine or 'fix the fault ourselves'.

3. MEAN TIME TO RESPOND AND REPAIR

- a. As Perceived By Users
- Exhibits III-30 through III-34 graphically display the ideal, minimum acceptable and current response and repair times as perceived by the users. The data have been displayed in a cumulative format, showing the percentage of respondents who experience response or repair times in, or close to, the time indicated.
 - These exhibits will be repeated in Chapter V with a comparison of users' and vendors' perceptions on this most important issue.

MAINFRAME MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR -
MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS
IN THE UNITED KINGDOM

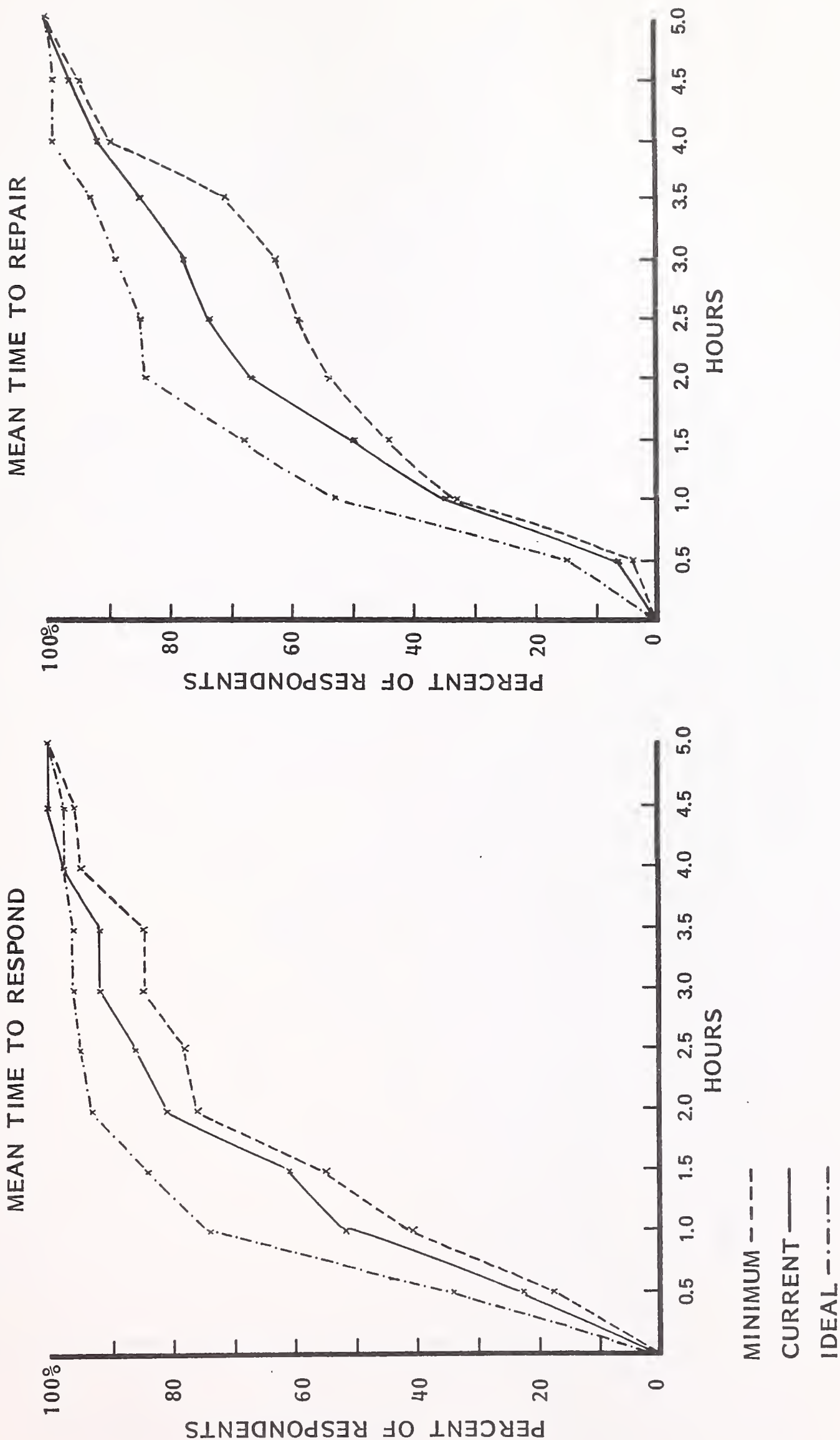


EXHIBIT III-31

SMALL BUSINESS MACHINE MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR - MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN THE UNITED KINGDOM

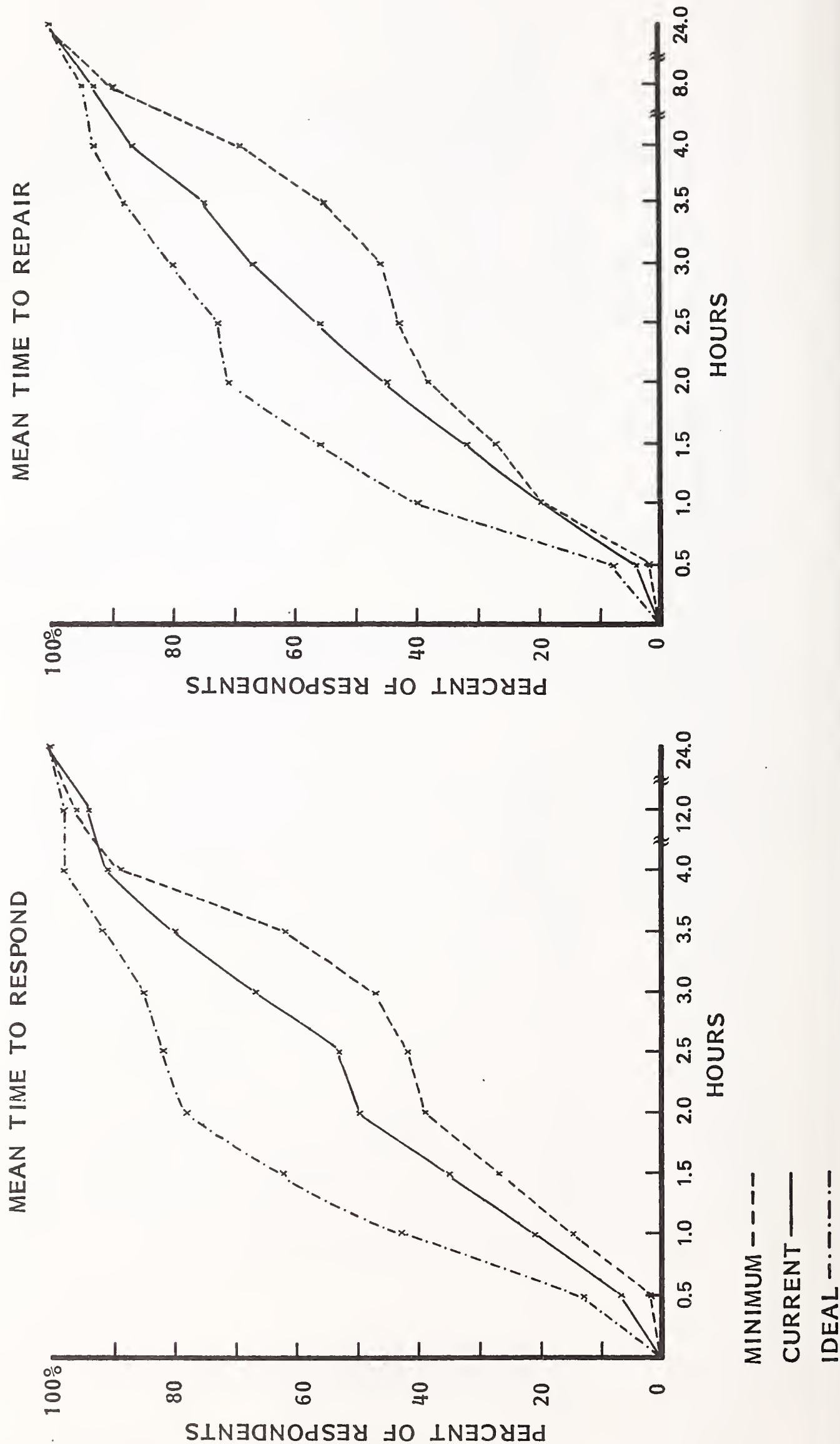


EXHIBIT III-32

MINICOMPUTER MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR - MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN THE UNITED KINGDOM

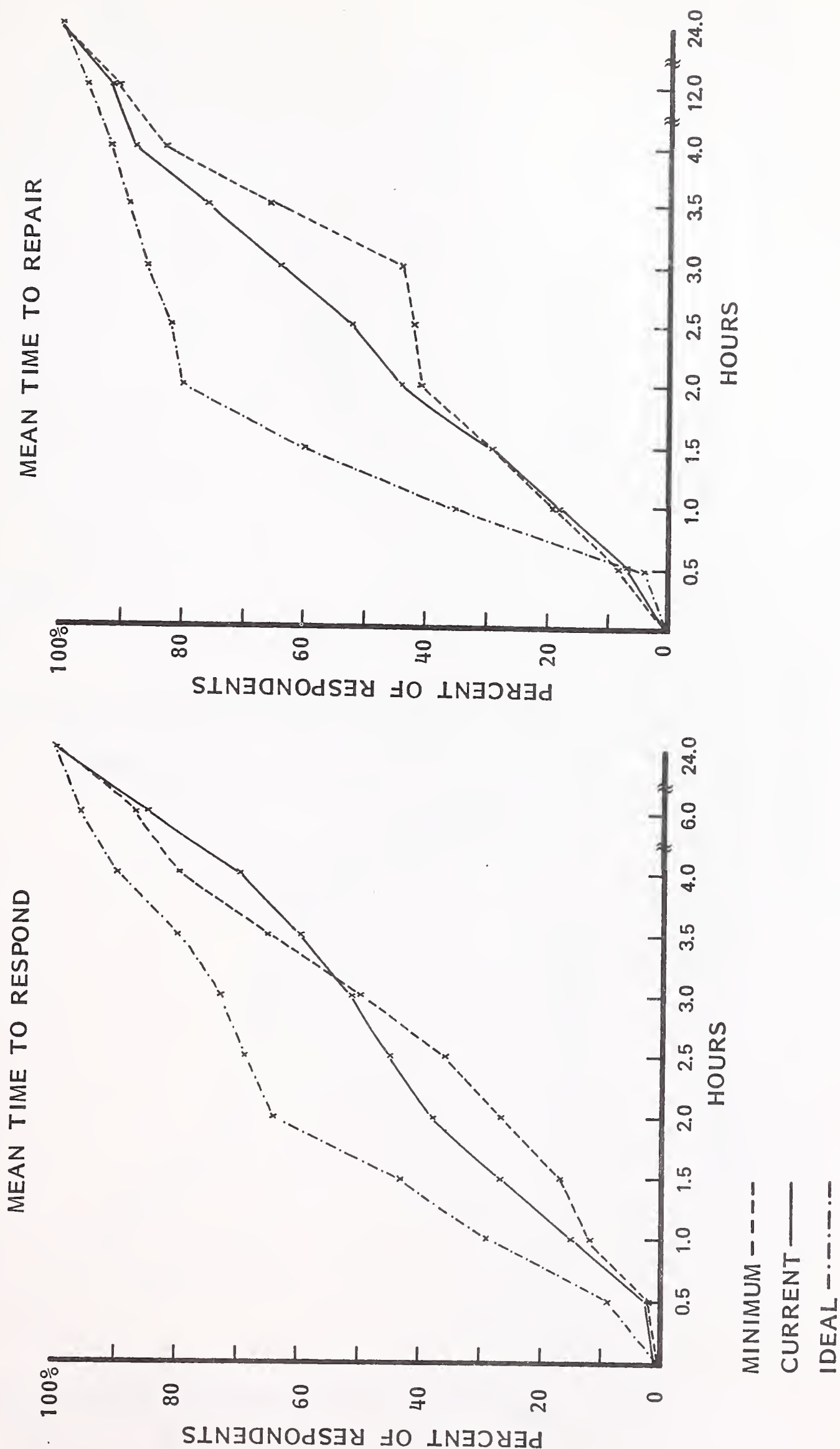
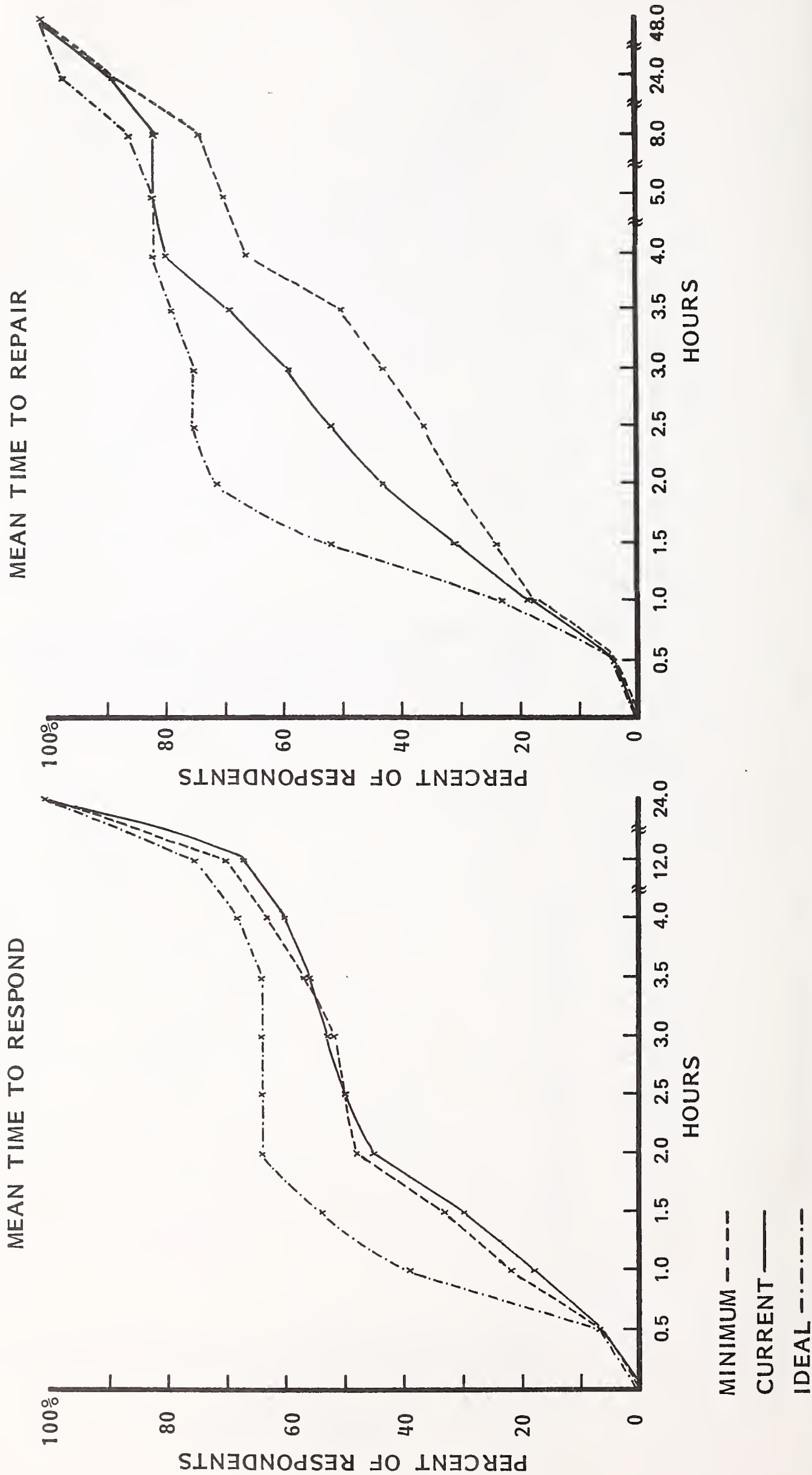


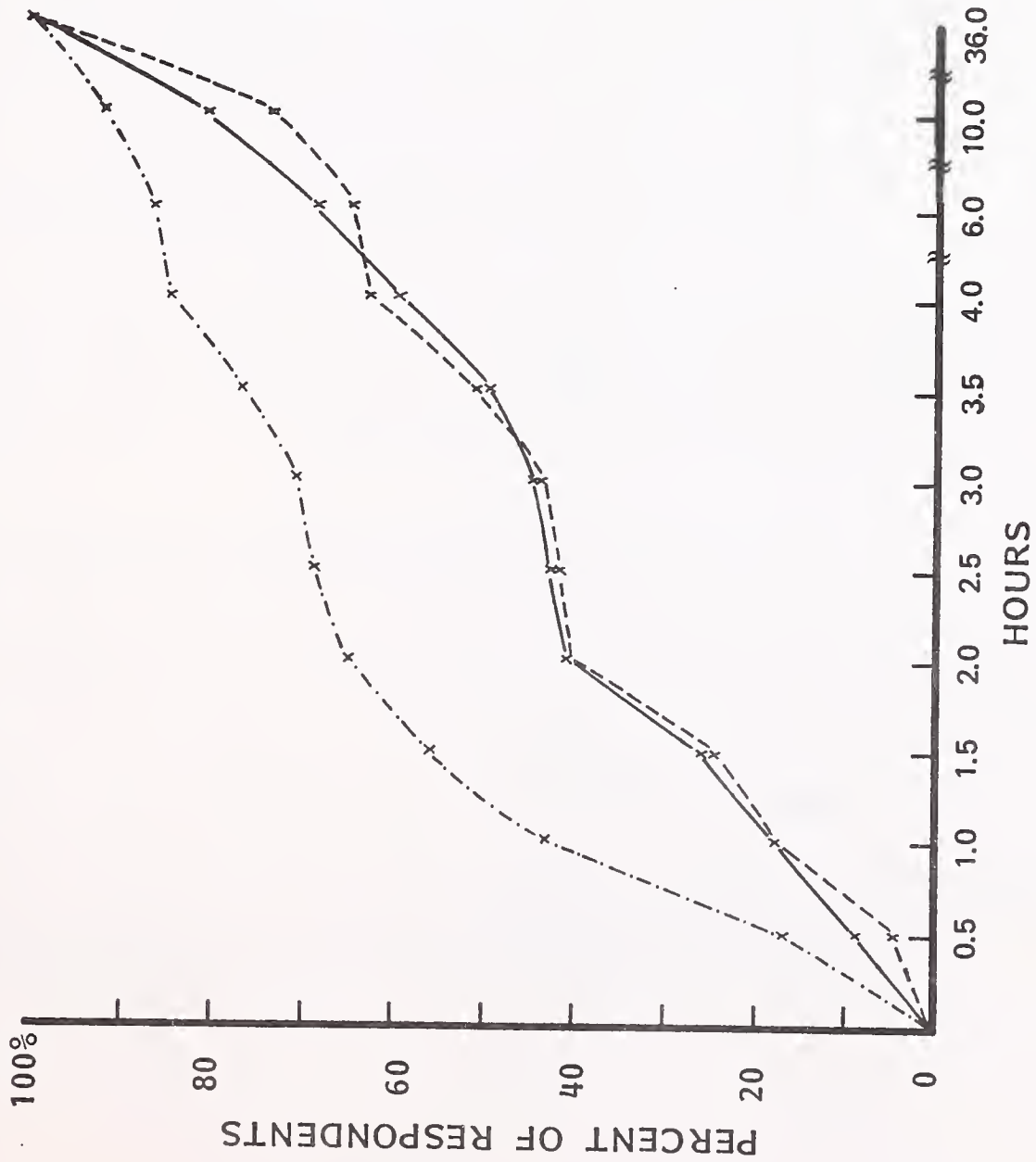
EXHIBIT III-33

PERIPHERAL MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR - MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN THE UNITED KINGDOM

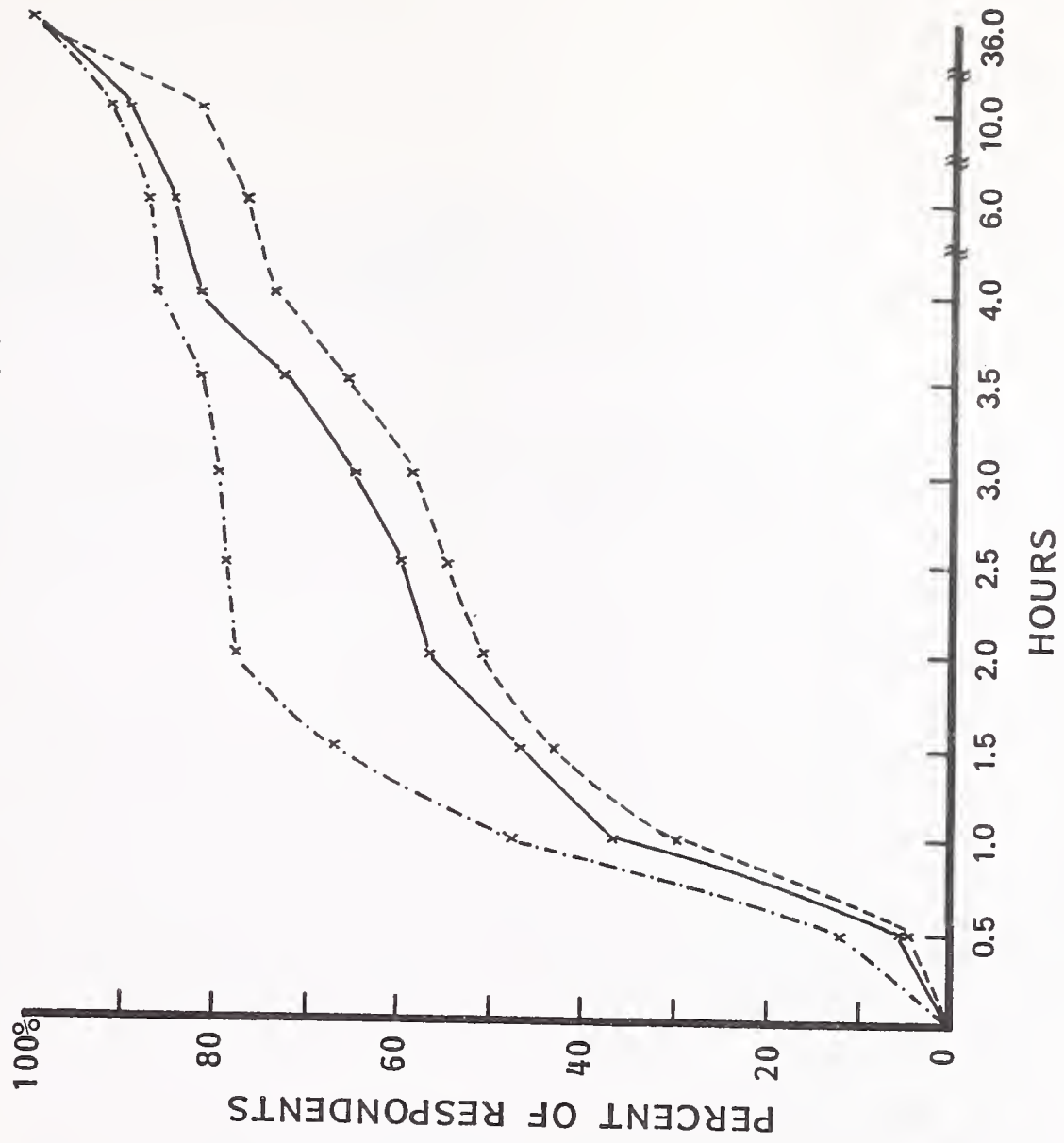


TERMINAL MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR -
MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS
IN THE UNITED KINGDOM

MEAN TIME TO RESPOND



MEAN TIME TO REPAIR



- In Chapter IV, these data are separated into IBM users' versus non-IBM users' perceptions to provide insight into the similarities and differences between the two.
- The ideal response times for mainframe failure should be no longer than four hours, according to 99% of users, as indicated in Exhibit III-30, and the machine should be repaired after an additional four hours again, as perceived by 99% of the respondents.
- When asked about the minimum acceptable performance, 95% drew the line at four hours for a response, with 90% tolerating a four-hour repair time.
- Actual response time and mean time to repair mainframes tend to fall neatly between ideal and minimum acceptable performance curves.
- Small business systems have been separately analysed from minicomputers with the data shown in Exhibits III-31 and III-32. The results show certain variances in opinion and actual times concerning the two types of equipment.
- The maximum response time - ideally, actual or tolerated - is 24 hours, although in each case over 90% gave a maximum of twelve hours.
- Once arrived, the engineer should take up to eight hours to complete the repair, according to 90% of respondent users. Again, mean time to repair lies between ideal and minimum performance.
- Minicomputer users are slightly less fortunate in the response times they receive, compared with the minimum performance they would tolerate.
- In fact, 80% claim that up to four hours is a minimally acceptable time, whereas only 70% are actually achieving this response time.
- Up to 44% of users find the one- and two-hour repair time they receive tolerable, although 15% do not expect this to get better.

- Users of peripherals are so far the least content as far as response times are concerned, as can be seen from Exhibit III-33.
 - The minimum performance and current mean time curves cross each other several times, until both reach a maximum of 24 hours for 100% of the users.
 - The 'ideal' curve shows 64% of the users wanting two hours up to three and one-half hours. Less than 40% find more than four hours minimally acceptable.
- Exhibit III-34 indicates an even lower level of satisfaction with response times received on behalf of terminal users. The curve representing current mean time to respond runs continuously only just above the minimum acceptable levels.
- At three hours, 44% consider this to be as long as they are prepared to tolerate; 45% actually receive that time, whereas 72% hold it to be their ideal expectation. One respondent stated that the vendor provided a free replacement terminal if the repair was to take over eight hours.
- Mean time to repair for terminals is more satisfactory, although the mean time curve tends more to follow the minimum performance than the ideal curve.

b. Users' Satisfaction With Response and Repair Times

- Exhibit III-35 shows that as much as 34% of respondent users would be willing to pay a 21% premium for improved response and/or repair times for hardware.
- This premium is highest in terms of peripheral equipment, which corresponds to users' dissatisfaction with the level of service they are receiving.

EXHIBIT III-35

USERS' WILLINGNESS TO PAY MORE FOR IDEAL MAINTENANCE IN THE UNITED KINGDOM

HARDWARE

CATEGORY	WILLING		NOT WILLING		AMOUNT WILLING TO PAY	
	NUMBER	PERCENT	NUMBER	PERCENT	AVERAGE PERCENT	RANGE PERCENT
MAINFRAMES	33	38%	54	62%	20%	5-33 %
SMALL BUSINESS MACHINES	21	34	40	66	23	5-100
MINICOMPUTERS	16	30	38	70	13	1-40
PERIPHERALS	10	37	17	63	32	10-100
TERMINALS	29	33	59	67	19	5-100
TOTAL	109	34%	208	66%	21%	1-100%

SOFTWARE

CATEGORY	WILLING		NOT WILLING		AMOUNT WILLING TO PAY	
	NUMBER	PERCENT	NUMBER	PERCENT	AVERAGE PERCENT	RANGE PERCENT
SYSTEMS SOFTWARE	20	44%	25	56%	32%	5-100%
APPLICATIONS SOFTWARE	12	44	15	56	29	5-100
TOTAL	32	44%	40	56%	31%	5-100%

- An even higher percentage of users, 44%, would be prepared to pay an average of 31% more for software maintenance.
- It should nevertheless be mentioned that seven respondents feel they already pay too much for their service:
 - 'At current rates, I feel we already pay for it.'
 - 'I would pay nothing extra, as I am almost there anyway.'
 - 'Service ought to be improved without any additional cost.'
- The above spread of responses should encourage hardware manufacturers and software vendors to tailor contracts for critical users.
- The level of users' satisfaction with response and repair times is revealed in Exhibit III-36. Respondents whose ideal times were either reached, or even improved upon, in their actual mean response and repair times, are analysed in the first two columns. The third and fourth columns examine those users whose current average times to respond and repair fall below their minimum acceptable levels.
- At first glance, peripheral users seem to be the most content, with 50% receiving their ideal level.
 - However, the right-hand column shows that they also have the highest percentage of dissatisfaction.
 - Over 30% of users in each response category are reaching their ideal, and even higher percentages of hardware users are receiving ideal repair times.
- Software users, especially applications software users, are not so easily pleased, as demonstrated by their high percentage of dissatisfied users.

EXHIBIT III-36

USERS' SATISFACTION/DISSATISFACTION WITH THEIR MAINTENANCE SERVICE IN THE UNITED KINGDOM

RESPONSE TIMES

EQUIPMENT TYPE	SATISFIED*		NOT SATISFIED**	
	NUMBER	PERCENT	NUMBER	PERCENT
MAINFRAMES	28	32%	13	15%
SBCs	19	32	15	25
MINICOMPUTERS	19	36	13	25
PERIPHERALS	14	50	10	36
TERMINALS	35	39	30	34
SYSTEMS SOFTWARE	17	45	12	32
APPLICATIONS SOFTWARE	8	35	5	22

REPAIR TIMES

EQUIPMENT TYPE	SATISFIED*		NOT SATISFIED**	
	NUMBER	PERCENT	NUMBER	PERCENT
MAINFRAMES	36	44%	16	20%
SBCs	22	39	14	25
MINICOMPUTERS	20	40	13	26
PERIPHERALS	11	42	8	31
TERMINALS	47	54	19	22
SYSTEMS SOFTWARE	10	29	12	35
APPLICATIONS SOFTWARE	2	9	10	44

*SATISFIED = THOSE RESPONDENTS CURRENTLY ATTAINING - OR IMPROVING ON - THEIR IDEALS

**NOT SATISFIED = THOSE RESPONDENTS WHOSE CURRENT AVERAGE FALLS BELOW THEIR
MINIMUM LEVEL OF SERVICE

- Terminal users appear well satisfied with their average repair times: 54% claim to have reached their ideal.

4. USERS' SATISFACTION WITH MAINTENANCE

- Respondent users were generally enthusiastic in their overall maintenance ratings, as shown in Exhibit III-37.
 - In all hardware categories, over half the respondents rated their overall satisfaction with their level of maintenance as being high.
 - Applications software is the only category where the highest percentage of users voted their satisfaction as being medium.
 - Mainframe and minicomputer users appear to be the most highly satisfied respondents, with a very small percentage giving a low rating.
- Alphabetical lists of hardware and software vendors are supplied in Exhibits III-38 and III-39 respectively. The total number of mentions and average ratings are given for each vendor.
 - The mainframe vendors most highly rated by their clients are CDC, IBM and Honeywell, with Hewlett-Packard, Burroughs, DEC, Univac and ICL around the average mark. The only mainframe vendor to score a low average is NCR.
 - Cable and Wireless, a third-party supplier, has been highly ranked by each of its client respondents with the highest average in the list: 4.5 on the 1-5 scale.
 - Among the hardware vendors, there appears to be no particular pattern emerging either in favour of or against satisfaction with maintenance supplied by British manufacturers. This could have been of significance

EXHIBIT III-37

USERS' GENERAL SATISFACTION WITH MAINTENANCE IN THE UNITED KINGDOM

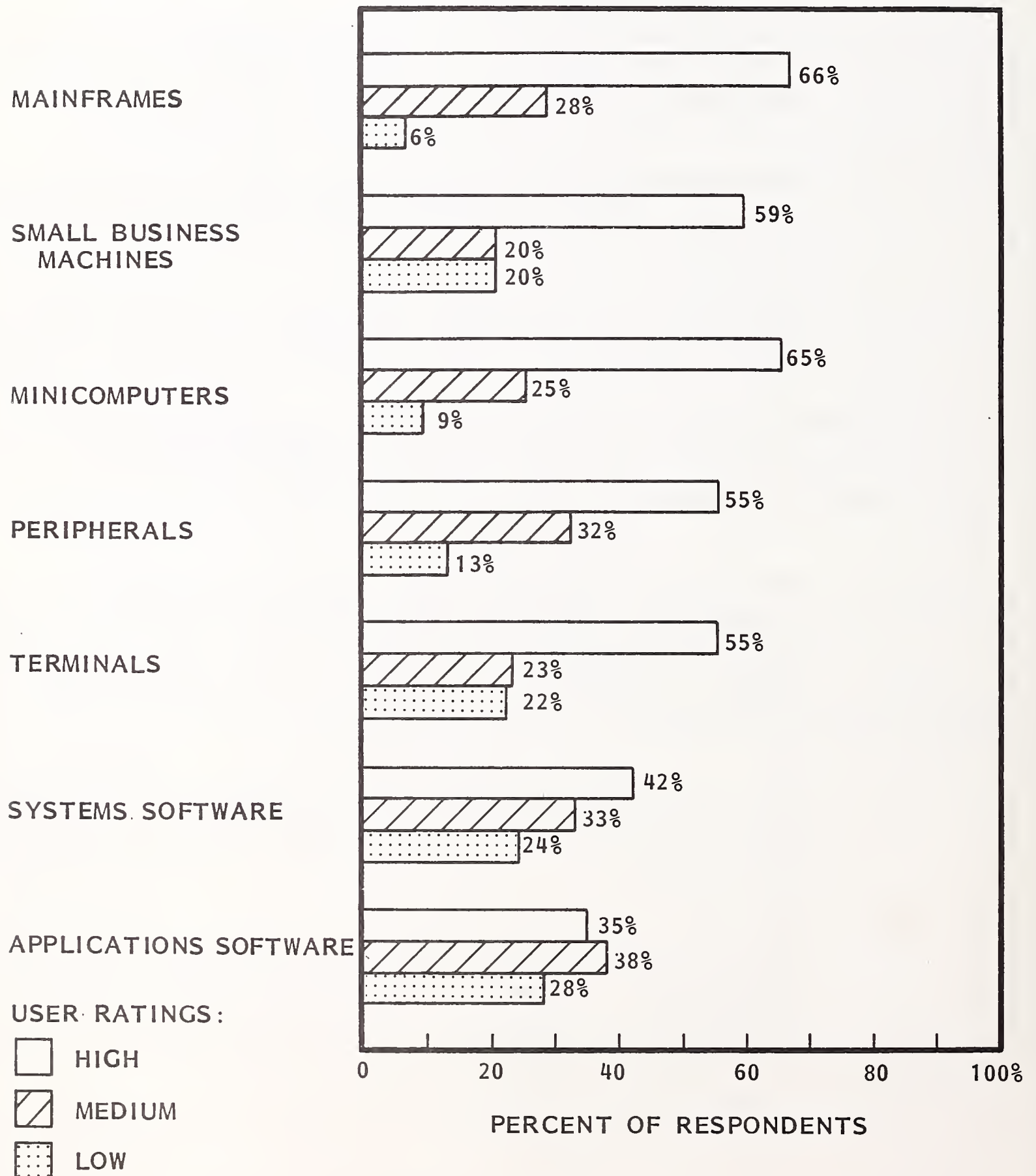


EXHIBIT III-38

USERS' RATINGS OF HARDWARE MAINTENANCE VENDORS
IN THE UNITED KINGDOM

VENDOR	RATING		VENDOR	RATING	
	TOTAL NUMBER OF MENTIONS	AVERAGE RATING		TOTAL NUMBER OF MENTIONS	AVERAGE RATING
ADLER	2	3.00	ICL*	61	3.34
BURROUGHS*	25	3.40	INCOTERM	2	3.50
CA	2	4.00	ITT	4	3.00
CABLE + WIRELESS	2	4.50	MEMOREX	6	3.50
CDC*	3	4.25	NCR*	5	1.20
CIL	2	2.00	NEWBURY LABS	4	3.75
CMC	4	4.25	PERICOM	4	3.00
CTL	3	4.00	PHILLIPS	2	3.50
DACOLL	2	3.00	PLESSEY	3	4.00
DATA GENERAL	7	3.43	PRIME	3	2.50
DATALOGIC	5	3.40	RACAL	2	2.50
DEC*	26	3.69	REDIFON	5	4.40
DELTA DATA	3	3.00	SYSTIME	4	2.75
GEC	3	3.67	TEKTRONIX	2	4.00
HAZELTINE	2	3.00	TEXAS INSTRUMENTS	2	3.00
HEWLETT- PACKARD*	13	3.69	UNIVAC	10	3.40
HONEYWELL*	20	3.75	VENTEK	10	3.70
IBM*	51	3.82			

AVERAGE RATING = 3.4 RATING: 1 = LOW, 5 = HIGH

N.B.: ONLY THOSE VENDORS MENTIONED AT LEAST TWICE HAVE BEEN LISTED; SINGLE MENTIONS HAVE BEEN OMITTED. HOWEVER, THEY AMOUNTED TO A TOTAL OF 20 VENDORS.

*MAINFRAME VENDOR

EXHIBIT III-39

USERS' RATINGS OF SOFTWARE MAINTENANCE VENDORS IN THE UNITED KINGDOM

VENDOR	RATING		VENDOR	RATING	
	NUMBER OF MENTIONS	AVERAGE RATING		NUMBER OF MENTIONS	AVERAGE RATING
APCO	1	3.00	MSS	1	5.00
BURROUGHS*	16	3.06	NAG	1	5.00
CAD	1	4.00	NCC	2	4.00
CDC*	2	3.00	NCR*	2	2.00
CEI	1	4.00	PETERBORO' DP	2	3.00
CINCOM	2	3.00	RTZ COMPUTING	1	3.00
CYNCOM	1	4.00	SAFE	3	3.33
DATA GENERAL	2	3.50	SCICON	1	2.00
DATALOGIC	1	1.00	SDI	2	3.50
DATASKIL	2	4.00	SEMAPHOR	1	4.00
DEC*	6	2.92	SIMDELL	1	3.00
GMS	1	3.00	SOFTWARE AG	1	3.00
GORDON & GOTCH	2	3.00	SP SUPPORT	1	5.00
HEWLETT- PACKARD*	3	3.00	SYSTIME	1	5.00
HONEYWELL*	7	3.00	TELECOMPUTING	2	4.00
IBM*	19	3.26	UCC	1	1.00
ICL*	21	3.62	UKAEA (HARWELL)	1	1.00
INTERSCAN	1	3.00	UNIVAC*	4	2.75
LP COMPUTING	1	3.00	VENTEK	3	3.67
MACRO 4	1	4.00	WESTINGHOUSE	1	4.00

AVERAGE RATING = 3.29 RATING: 1 = LOW, 5 = HIGH

*MAINFRAME VENDOR

in terms of spare parts availability or local expertise on imported equipment, for instance.

- Discounting single mentions in the list of software vendors, highest averages are scored by the ICL-owned Dataskil, Ventek and ICL. IBM, interestingly, falls marginally short of the average of 3.29, with the remaining mainframe vendors even lower.
- No single vendor, apart from Ventek, receives consistently good ratings. NCR, however, falls way below the average in both its hardware and software ratings.
- In the U.K., no respondent claimed to have been sufficiently disillusioned with mainframe maintenance to change vendors, as shown in Exhibit III-40. This compared with 4% in the rest of Western Europe.
- The eighteen responses concerning replaced vendors divide neatly into the three remaining categories. This does not compare with Europe as a whole - especially in terms of peripheral equipment, where over half the respondents replacing vendors had done so concerning this type of equipment.
- IBM, significantly absent from the list of hardware vendors replaced, as seen in Exhibit III-41, appears as the only software vendor to be replaced by more than one respondent user, as seen in Exhibit III-42. However, this figure is low when compared with the high number of mentions it receives in Exhibit III-39.
- Burroughs and ICL are each mentioned by two respondents in the list of replaced hardware vendors, and ICL software has been replaced by one respondent. As with IBM, this is a reflection of ICL's high usage.

5. USERS' SATISFACTION WITH PERSONNEL AND PROCEDURES

- The high turnover both in field engineers and their managers is responsible for most of the discontent experienced by users.

EXHIBIT III-40

NUMBER OF VENDORS REPLACED
DUE TO POOR MAINTENANCE IN THE
UNITED KINGDOM

TYPE OF HARDWARE	UNITED KINGDOM	TOTAL WESTERN EUROPE
MAINFRAME	0%	4%
SBS/MINI	33.3	24
PERIPHERAL	33.3	52
TERMINAL	33.3	20

TOTAL NUMBER OF RESPONDENTS IN THE U.K. = 18

EXHIBIT III-41

HARDWARE VENDORS REPLACED DUE TO POOR MAINTENANCE IN THE UNITED KINGDOM

VENDOR	EQUIPMENT REPLACED
BURROUGHS	MINICOMPUTER
BURROUGHS	TERMINALS
CASE	TERMINALS
DATA DYNAMICS	TERMINALS
DATA GENERAL	MINICOMPUTER
FEEDBACK DATA	FACTORY COLLECTION SYSTEM
ICL	DISC/TAPE
ICL	MINICOMPUTER
ITT	TERMINALS
LOGICON	DATA SIGNALLING UNITS
OLIVETTI	TERMINALS
OLIVETTI	PERIPHERALS
SMS	MEMORY
SYSTIME	MINICOMPUTER
TEXAS INSTRUMENTS	TERMINALS

N.B.: THREE ADDITIONAL MACHINES WERE MENTIONED, BUT NO VENDOR'S NAME WAS SUPPLIED.

EXHIBIT III-42

SOFTWARE VENDORS REPLACED
DUE TO POOR MAINTENANCE IN THE
UNITED KINGDOM

VENDOR	NUMBER OF RESPONDENTS
IBM	2
UNIVAC	1
ICL	1
DEC	1
SYSTIME	1
TONE SOFTWARE CORP. (USA)	1

TOTAL RESPONSE = 7

- Exhibit III-43 provides statistics on the three categories: 'same' (over the past year), 'better' and 'poorer'.
- Almost equal opinion was given to both 'better' and 'poorer', in terms of the standard field engineer, with a slightly higher percentage (39%) acknowledging no change. It must be borne in mind that the category 'same' could apply equally to a consistently bad record as to a consistently good one.
- Users' comments regarding the management of engineering staff, under the heading 'same' standard, include:
 - 'Quality hasn't changed - it's still poor!'
 - 'Quality of service is high and it would be unreasonable to expect an improvement.'
- The problem in the U.K., with exactly the reverse experienced in Germany, is that engineers either change employers or receive promotion to managerial positions, causing the high turnover in both levels of personnel.
- The importance of consistency in engineering personnel comes through loud and clear from the comments of users claiming no change in their standard of engineers servicing equipment.
 - 'Have had the same engineers for the past ten years.'
 - 'No change in personnel.'
 - 'Tendency (for standard) to fluctuate as engineers change until they become fully familiar with the installation.'
 - 'Quality has been high, but we've always had the same engineer.'
- And from those who have experienced too many staff changes:

EXHIBIT III-43

CHANGES IN THE QUALITY OF FIELD
ENGINEERS AND FIRST-LINE MANAGERS IN THE
UNITED KINGDOM

CHANGE	FIELD ENGINEERS	FIRST LINE MANAGERS
SAME	39%	51%
BETTER	31	31
POORER	30	18

- 'Quality engineers are moving to management or large multicomputer sites, and replacements are of lower calibre.'
 - 'We have the old ICL 1900 kit, and good engineers have moved to the 2900.'
 - 'Engineers seem to progress faster these days. They seem to use us as a training ground - this is true of IBM, DEC, Philips and Newbury Labs; Data 100 seem better.'
 - 'Because engineers are leaving or progressing, managers are less experienced and have fewer resources to call on.'
- Structural changes within vendors' organisations have rarely been for the better:
 - 'The management changed a year ago - and has deteriorated.'
 - 'A recent change in management structure has made them even more out of touch.'
 - 'Re-designation of service area' has led to poorer service.
 - The overall impression from these and similar responses is a feeling of being neglected. This could be sheer misfortune on their part, since other users are reaping benefits by virtue of these same structural changes.
 - However, almost to a person, the responses concerning the engineers themselves, by those users receiving poor service, indicated that training - or rather the lack of it - was the major problem.
 - Advances in technology, new equipment and subsequent rapid growth of vendor organisations are without doubt the cause. Training cannot keep up.

- 'Lack of training.'
- 'A problem of training shortcomings.'
- 'Number of FEs has diminished - training not as good.'
- Users who stated that the quality of engineering has improved were far more reticent about supplying reasons. From the comments of those who were more candid, it is evident that they are at a different and more favourable stage of the same cycle previously described.
 - In the case of these respondents, the vendor company is more stable and has successfully trained new staff, and engineers have even gained a good amount of experience.
 - 'Engineers are now assigned to certain sites so that they get to know the computers; previously different engineers used to appear.'
 - 'FEs are now better managed and seem to be better trained for the devices.'
 - 'Hewlett-Packard were very stretched when our equipment was first installed two years ago, but the situation has improved with the recruitment of more engineers and better training of existing ones.'
- For certain respondents the standard improved only after firm pressure had been put on the vendor company.
 - 'Due to complaints by me, we were switched from one engineering office to another at the end of 1979. This has resulted in improved quality.'

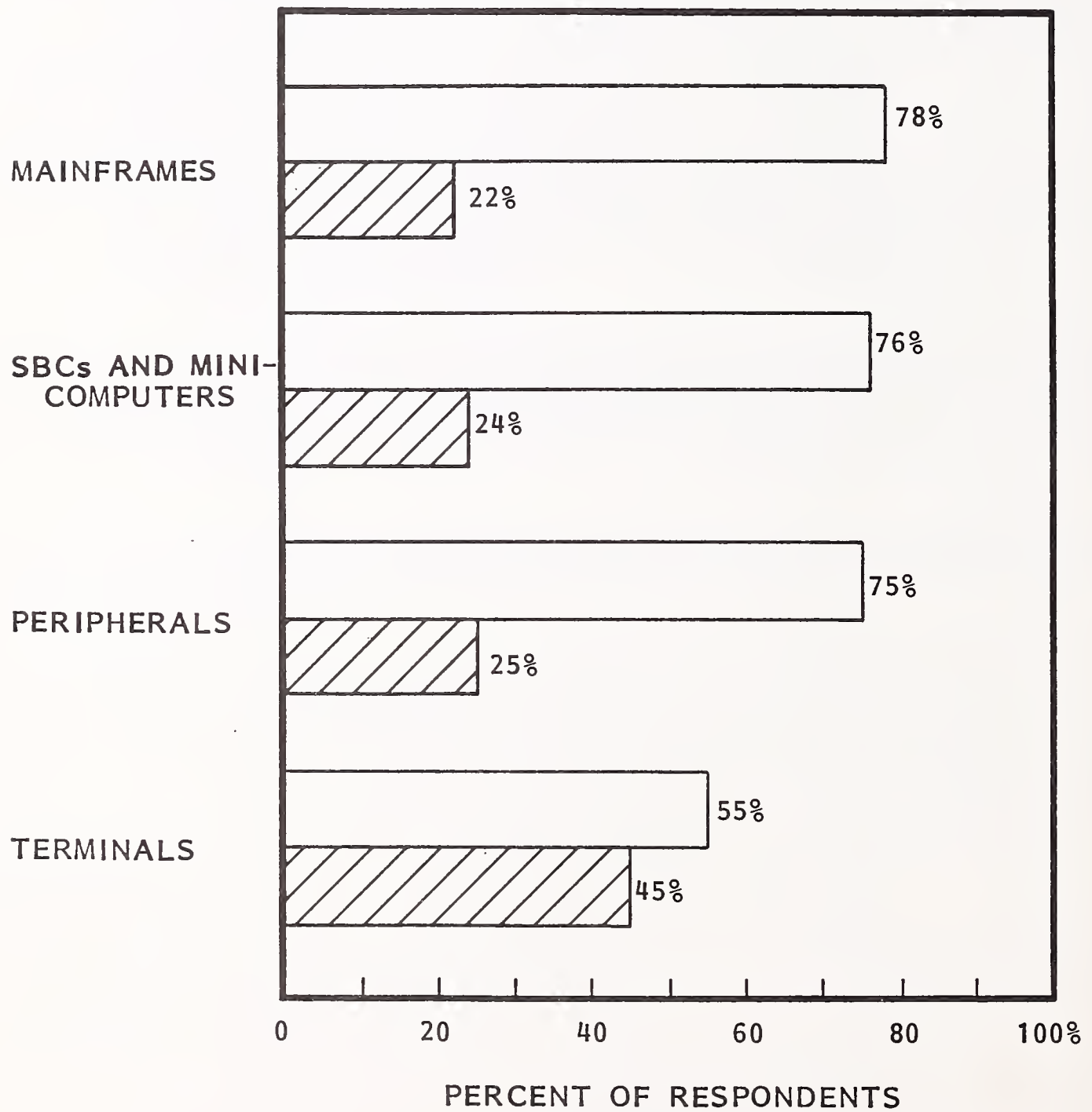
- 'We have been active in complaint.'
- Some respondents are fortunate in that they have established a sort of rapport with the individual manager who has emerged as the result of a reorganisation.
- A recommendation to managers based on these data would be to establish better relationships with users in general, and to adopt the attitude that they exist for the users' convenience and not the other way round.
- 'Management are not living in the real world of current needs. They still feel we should give them our equipment during their working hours, for preventive maintenance, whilst we're trying to provide a real-time system to the company during our working hours. These two obviously conflict.'
- 'Engineering management has been far more concerned with financial considerations rather than with providing the best possible service to the customer.'

6. USERS' ATTITUDES AND CONCERNS ABOUT UNBUNDLING MAINTENANCE

- Three-quarters of the respondents prefer a fixed-price contract for maintenance for most types of equipment, as expressed in Exhibit III-44. The exception is terminal equipment, where the percentage is 55%.
- Ease of budgetting, convenience and a regular service for critical, high-usage equipment are the principal factors governing this preference.
- An incremental charge on service provided was favoured for less critical or duplicated machines, such as terminals, and by users believing it gave more control over expenditure. This, though, was also a reason supplied by a user favouring the fixed-charge system.

EXHIBIT III-44

UNBUNDLING OF MAINTENANCE BY EQUIPMENT TYPE
IN THE UNITED KINGDOM



- ☐ USERS FAVOURING FIXED PRICING STRUCTURE
- ☒ USERS FAVOURING AN INCREMENTAL PRICING STRUCTURE

- '(Fixed monthly charge) allows better control of maintenance service by invoking contractual terms and withholding monthly payment if not satisfied.'
- '(Incremental charge) facilitates assessment of quality of service related to fault.'
- Users were asked to what extent they were performing their own maintenance
 - and whether they would consider performing certain functions normally carried out by an engineer. The results are shown in Exhibit III-45.
 - A large majority of users are neither currently performing, nor would consider undertaking, any of the five tasks suggested to them.
 - The only function receiving a respectable amount of interest is that of diagnostics, where 44% are currently performing this and 43% of the remainder are prepared to give it due consideration. This is reasonable as it is the simplest and most practical way in which they can assist the engineer.
 - Least popular is the idea of delivering faulty equipment to the vendor depot for repair, as only 7% of respondents are currently doing this and only 7% of the remainder are prepared to even consider it.
 - The greatest cost saving, 23%, is achieved by those currently installing their own equipment. The 16% of users not currently performing their own software maintenance, but who are considering it, are expecting to save 28%, compared to the 20% saving by those who are maintaining their own software.
- In general the idea of paying for on-site spares was not acceptable, by a ratio of 2:1.

EXHIBIT III-45

USERS' WILLINGNESS TO PERFORM MAINTENANCE ACTIVITIES
IN THE UNITED KINGDOM

TYPE OF USER	INSTALL EQUIPMENT	PERFORM DIAGNOSTICS	HARDWARE MAINTENANCE	SOFTWARE MAINTENANCE	DEPOT MAINTENANCE
NOT CURRENTLY PERFORMING	79%	56%	87%	64%	93%
CURRENTLY PERFORMING	21	44	13	36	7
PERCENT SAVINGS	23	4	15	20	21
NOT PERFORMING - WOULD NOT CONSIDER	93	57	92	84	93
WOULD CONSIDER	7	43	8	16	7
ANTICIPATED PERCENT SAVINGS	15	3	ND	38	5

ND = NO DATA

- Obviously, availability and an overall reduction in downtime were the reasons given by most of the 41 respondents in favour of the idea, but bad experiences on the part of several who had tried it once induced them to be wary of the suggestion, as is borne out by their comments:
 - . 'We used to be the area stores location for IBM. It didn't work as we rarely had the correct part. Anyway, if you don't hold some spares, you don't deserve continual uptime.'
- Others certainly didn't expect to pay for providing this facility:
 - . 'Too great a range - this would result in redundancy. But I would provide accommodation for manufacturers' spares free.'
 - . 'The supplier should stock spares on site - it should be a part of maintenance.'
 - . 'Burroughs should be well pleased to have spares in Scotland - the main spares centre is 30 miles away.'
- Many felt that it was not their responsibility.
 - . 'Current charges are high enough to expect adequate and timely supply of spares wherever they may be held.'
 - . 'Remote diagnostics let the engineer know which spares are required and when.'

7. USERS' ATTITUDES TOWARDS THIRD-PARTY MAINTENANCE

- Of those respondents currently using third-party sources, 50% switched to TPM to receive better service, as they were disillusioned with the level of service supplied by the equipment manufacturer, as shown in Exhibit III-46.

EXHIBIT III-46

PERCEPTIONS OF CURRENT USERS AND POTENTIAL USERS OF THIRD-PARTY MAINTENANCE IN THE UNITED KINGDOM

FACTOR	CURRENT USERS	POTENTIAL USERS
COST SAVINGS	19%	56%
DISSATISFIED WITH MANUFACTURER/ BETTER SERVICE	50	33
NO OTHER MAINTENANCE AVAILABLE/* ORIGINAL SUPPLIER OF EQUIPMENT	19	N/A
MULTIVENDOR INSTALLATION	6	6
LONG-TERM SECURITY	6	0
COMPETITION IS HEALTHY	0	3
NOT SO AFFECTED BY TRADE UNIONS	0	1
MORE POSITIVE APPROACH TO CUSTOMER RELATIONS	0	1

*E.G., WHERE THERE IS NO DIRECT DOMESTIC MAINTENANCE AVAILABLE FOR IMPORTED EQUIPMENT.

- 'We were dissatisfied with IBM; our hardware is 360 and only a few engineers know how to service it - they are probably behind desks now.'
 - 'Multivendor installation' was surprisingly mentioned only by a single current user, and 6% of the potential users.
 - Cost saving was the second most popular reason for existing users, but the overriding factor for potential users.
 - Five percent of non-users believe third-party maintenance to be more expensive.
 - It is the only type of maintenance available in the U.K. for certain equipment for 19% of current users.
- Exhibit III-47 gives the reasons for not using TPM, as supplied by those users of maintenance provided by equipment manufacturers.
 - Thirty percent are perfectly happy with their maintenance and believe it to be superior to that offered by third parties.
 - Twenty-seven percent feel the manufacturer best knows his own products, can train his engineers to become experts, and keep them better up-to-date.
 - Exhibit III-48 shows the cost savings achieved by third-party users, which is actually higher, at 22%, than that anticipated by would-be users, at 17%.
8. USERS' SENSITIVITY TO MAINTENANCE PRICING
- When asked what they planned to do about rising maintenance costs, nearly all respondents had no definitive answer and appeared to be resigned to the inevitability of increases in maintenance prices.

EXHIBIT III-47

THIRD-PARTY MAINTENANCE IN THE UNITED KINGDOM:
NON-USERS' PERCEPTIONS AND REASONS FOR NOT CONSIDERING

FACTOR	PERCENT
HAPPY WITH CURRENT SUPPLIER/ BELIEVE HIS SERVICE IS BETTER	30%
MANUFACTURER KNOWS HIS PRODUCT BEST/ HAS EXPERTISE, TRAINED ENGINEERS, ETC.	27
BAD EXPERIENCE WITH TPM IN THE PAST	8
LEGALLY IMPOSSIBLE AT PRESENT (RENT/ LEASE ARRANGEMENTS WITH MANUFACTURER)	8
TPM IS MORE EXPENSIVE	5
MANUFACTURER IS TOTALLY UP-TO-DATE IMPOSSIBLE FOR TP'S	5
TOO RISKY	5
MANUFACTURER'S RESPONSIBILITY	3
REDUCES NEGOTIATING STRENGTH	3
THIRD PARTIES ARE LIABLE TO BE FINANCIALLY INSECURE	3
NEITHER SITUATION IS REALLY COMMITTED TO CUSTOMER INTEREST	3

EXHIBIT III-48

COMPARISON OF COST SAVINGS BY
CURRENT AND POTENTIAL THIRD-PARTY USERS IN THE
UNITED KINGDOM

COST SAVING	CURRENT USERS	POTENTIAL USERS' EXPECTED SAVING	PERCENT OF NON-USERS WHO WOULD CONSIDER
AVERAGE	22%	17%	58%
RANGE	5-50	5-35	

- One-third of all respondents simply gave in, making remarks such as:
 - . 'Pay', 'grin and bear it' and 'accept it'.
- Others were prepared to fight back:
 - . 'Consider other sources, such as third party.'
 - . 'Complain . . . negotiate.'
 - . 'Reduce cover.'
 - . 'Do more in-house maintenance.'
 - . 'Try to get better value by being unaccommodating to delays caused by inexperience.'
 - . 'Insist costs are kept to a minimum, through user group participation.'
- Further responses indicated a hope that the trend of rising costs would be balanced by new, more reliable machines that would require less maintenance.
- Three respondents saw remote diagnostics as the answer.
- The table below shows users' perceptions of how maintenance costs have actually changed in the last twelve months.

Users' Perceptions of Maintenance
Cost Changes

	<u>Change In Cost</u>	<u>Average Change</u>	<u>Change Relative to Value of Eqpt.</u>	<u>Average Change</u>
Increased	81%	19%	57%	16%
No change	13	-	31	-
Decreased	<u>6</u>	18	<u>12</u>	23
	100%		100%	

9. USERS' ATTITUDES TOWARDS ELIMINATING PREVENTIVE MAINTENANCE

- A clear majority of respondent users (62%) would not consider eliminating preventive maintenance (PM). Nevertheless, PM takes third place behind mean time to respond and mean time to repair, in a rating of these field maintenance characteristics, as seen in Exhibit III-49.
- On a scale of 1-5, PM received an average of 3.3 points. Although this is well above the mean, it is still regarded as the least important of the three.

10. USERS' ATTITUDES TOWARDS REMOTE DIAGNOSTICS

- Of the users with a remote diagnostic facility, 43% found the quality of service improved, 43% found it stayed the same, and 14% felt it was worse.
- Some users could not comment since the facility was new to them and untested.

EXHIBIT III-49

IMPORTANCE OF FIELD MAINTENANCE CHARACTERISTICS IN THE UNITED KINGDOM - USERS' RATINGS

FACTOR	PERCENT HIGH RATINGS	AVERAGE RATING*
MEAN TIME TO RESPOND	90%	4.5
MEAN TIME TO REPAIR	88	4.4
PREVENTIVE MAINTENANCE	44	3.3

*RATED ON A SCALE OF 1 TO 5, WHERE 1 = LOW AND 5 = HIGH.

- The average length of time that remote diagnostics had been installed was 14.4 months.
- The vendors identified as offering this service were:
 - CEC.
 - Digital Equipment Corporation.
 - GEC.
 - Hewlett-Packard.
 - Honeywell.
 - IBM.
 - ICL (software only).
 - MDS.
 - Prime.
 - Racal.
- A small number of users who rated remote diagnostic effectiveness appeared, from comments, to confuse traditional telephone diagnostic assistance with on-line remote diagnostic capabilities.
- When non-users were asked for their reactions if offered a remote diagnostic facility, comments were varied:
 - 'It would be useful if regular PM would then not be required.'

- 'But we'd still want to have regular PM.'
- 'We'd welcome it, but would then monitor equipment performance more closely for a time to ensure mean time between failure did not deteriorate.'
- 'I have a sneaky suspicion it would lead to more "fixing" than repairing, if we're not careful.'
- 'Reading between the lines' of the users' comments revealed the three main concerns regarding remote diagnostics:
 - Cost, either as a possible saving on overall maintenance costs, or a fear that additional costs would be incurred.
 - Quality of service, including reductions in both response and repair time.
 - Security.

II. USERS' PERCEPTIONS OF ESCALATION PROCEDURES

- Exhibit III-50 shows both existing and potential users' views on how escalation procedures do or would affect their service.
 - In fact, 95 out of a total of 126 respondents are currently provided with this facility by their vendors.
 - Only one respondent felt the quality of service had declined as a result.
 - Of those not receiving this service, 59% considered their service would worsen if it were provided.
- Comments from those with this facility vary:

EXHIBIT III-50

USERS' SATISFACTION LEVELS WITH ESCALATION PROCEDURES (ACTUAL AND PERCEIVED BY RESPONDENTS WITHOUT THIS FACILITY) IN THE UNITED KINGDOM

COMMENT	RESPONDENTS WITH A FORMAL ESCALATION PROCEDURE		RESPONDENTS WITH- OUT A FORMAL ESCALATION PROCEDURE	
	NUMBER	PERCENT	NUMBER	PERCENT
IMPROVED	64	68%	6	19%
SAME	7	7		
POORER	1	1	19	59
NON-COMMITTAL/ DON'T KNOW, ETC.	22	24	7	22
TOTAL	94	100%	32	100%

VENDORS PERCEIVED AS OFFERING FORMAL ESCALATION PROCEDURES:

MAINFRAME VENDORS	PERCENT	NON-MAINFRAME VENDORS	VENDORS
IBM	23%	DEC	10%
ICL	37	VENTEK	4
BURROUGHS	11	DATA GENERAL	3
HONEYWELL	6	MEMOREX	3
UNIVAC	2	HEWLETT-PACKARD	2
CDC	1	ITT	2
SYSTEMS MAINTENANCE SERVICES	1	BASF	1
NCR	1	NAS	1
		CTL	1
		GEC	1
		HARRIS	1
		DPCE	1

N.B.: SEVERAL RESPONDENTS MENTIONED MORE THAN ONE SUPPLIER

- 'Engineer needs encouraging to escalate, but help is virtually forthcoming.'
- 'Excellent in severe cases.'
- 'Provides for higher levels of engineering expertise without too much customer intervention.'
- 'Very little effect - the engineers don't always keep to the procedure without being encouraged by myself.'
- 'Provides local engineers with both technical and management support.'
- 'It is rarely followed to the letter, therefore has little effect.'
- 'If outage is in excess of four hours, in-depth technical support is provided automatically.'
- 'This is a vital feature of support. On-site engineers tend to be GPs who can call on specialist support.'
- Non-user respondents who would like this facility expect it would improve planning control, decrease response time and, as one respondent put it:
 - 'Enable me to insist on better qualified engineers to be available for repairs'.
- Others were not quite sure what it entails:
 - 'What is a "formal escalation procedure"? Does it, perhaps, drive one up the wall?'
- An additional user felt that if engineers were available who could help, they should have been sent in the first place.

12. EFFECTIVENESS OF NEW MAINTENANCE TECHNIQUES INTRODUCED BY VENDORS

- Respondents were asked to name any techniques that their vendors had recently introduced, and to indicate how effective they had been. The most effective techniques include the following:
 - An on-site (senior) problem manager.
 - Better local spares availability.
 - Off-line maintenance.
 - More built-in diagnostics and fault recording.
 - The establishment of a new response centre with greater details of clients' sites on hand for engineers.

13. USERS' COMMENTS ON MAINTENANCE IMPROVEMENT

- Users indicated they would like to have the following improvements implemented:
 - 'Better-trained and well-equipped engineers.'
 - 'More engineers.'
 - 'On-site engineers.'
 - 'Improved spares holdings.'
 - 'Better diagnostics.'
 - 'Better preventive maintenance.'

- 'Improved software maintenance.'
- 'Incentive schemes for engineers - so that they stay!'
- 'Escalation on all contracts.'
- 'Radios in engineers' cars.'
- 'All round better communication between vendor and user.'

D. USER RESPONSES: FRANCE

I. VENDOR PROFILES

- As in the U.K., French respondents were asked to identify their maintenance vendors for five different types of hardware equipment:
 - Medium to large mainframes.
 - Small business systems.
 - Minicomputers.
 - Peripherals.
 - Terminals.
- Small business systems and minicomputers were then combined in the analysis. Appendix B shows the vendors used for each commodity type. Exhibit III-51 lists the mainframe vendors identified.

EXHIBIT III-51

MAINFRAME MAINTENANCE
VENDORS IN FRANCE

VENDOR	PERCENT OF RESPON- DENTS
IBM	50%
HONEYWELL-BULL	33
ICL	9
BURROUGHS	3
LOCAFRANCE	1
PHILIPS	1
PRIME	1
SIEMENS	1
TANDEM	1

- IBM and Honeywell-Bull are clearly the market leaders in France for almost all types of hardware and for both types of software.
- Both organisations, located in Paris, are also the European headquarters of these multinational companies, and a large proportion of total European marketing effort has been concentrated on the home market.
- The only challenge appears in the supply of peripheral equipment by Memorex, with a 23% share, well above Honeywell-Bull's 10% share and only marginally behind IBM's 28% share.
- Although IBM and Honeywell-Bull possess between them 83% of the mainframe mentions, and 52% of respondents' terminals, small business computers and minis are provided by twenty-four additional vendors, who between them easily have the major share of the market.
- The French user market is certainly less happy than its U.K. counterpart with the response and repair times received, and is willing to pay substantially higher premiums for an improvement. On the other hand, the actual quality of the maintenance service is considered to be very high.
- Remote diagnostics are a welcome innovation, but escalation procedures are definitely not favoured by French users.
- The market is largely dominated by IBM, with Honeywell-Bull as runner-up, and it should be borne in mind that a large majority of responses refer to users' perceptions of the service they receive from these two vendors.
- A lack of competent, fully trained engineers is a persistent problem and one for which there is no foreseeable solution.
- Software is supplied by a variety of vendors, although it would appear that most IBM mainframe users are using IBM systems software, as evidenced by the similarity in market proportions for each.

2. USERS' ATTITUDES CONCERNING MAINTENANCE AND COVERAGE

- The only area where the time and materials basis of payment is used at all by respondents is in applications software. For systems software and all types of hardware, contracts are preferred, as shown in Exhibit III-52.
- Only 1% of all responses favoured time and materials.
- On the subject of maintenance coverage, Exhibit III-53 shows that only 5% of respondents are receiving seven-day coverage, and only an additional 6% have six-day coverage. Even those respondents with five-day coverage are mostly receiving seven to ten hours.
- When asked how their coverage was likely to change in the future, very few felt that it would, although several wished it were possible.
 - 'No extension possible despite our needs for Saturday coverage. Reason given to us: "impossible in the suburbs of Paris".'
 - 'Around-the-clock service is too expensive.'
 - 'Eight hours a day, five days a week is insufficient, but we are not planning to change.'
- Outside normal working hours, the attitude of the French respondents is to wait until the following day, rather than pay for an engineer's visit on a time and materials basis. In fact, only 26 out of 73 respondents were prepared to do this, another 26 preferred to wait, and a further 14 said that, although they put out an immediate call, they did not normally expect the engineer to arrive until the following day.
- Other respondents used a duplicate system or negotiated a special contract beforehand.

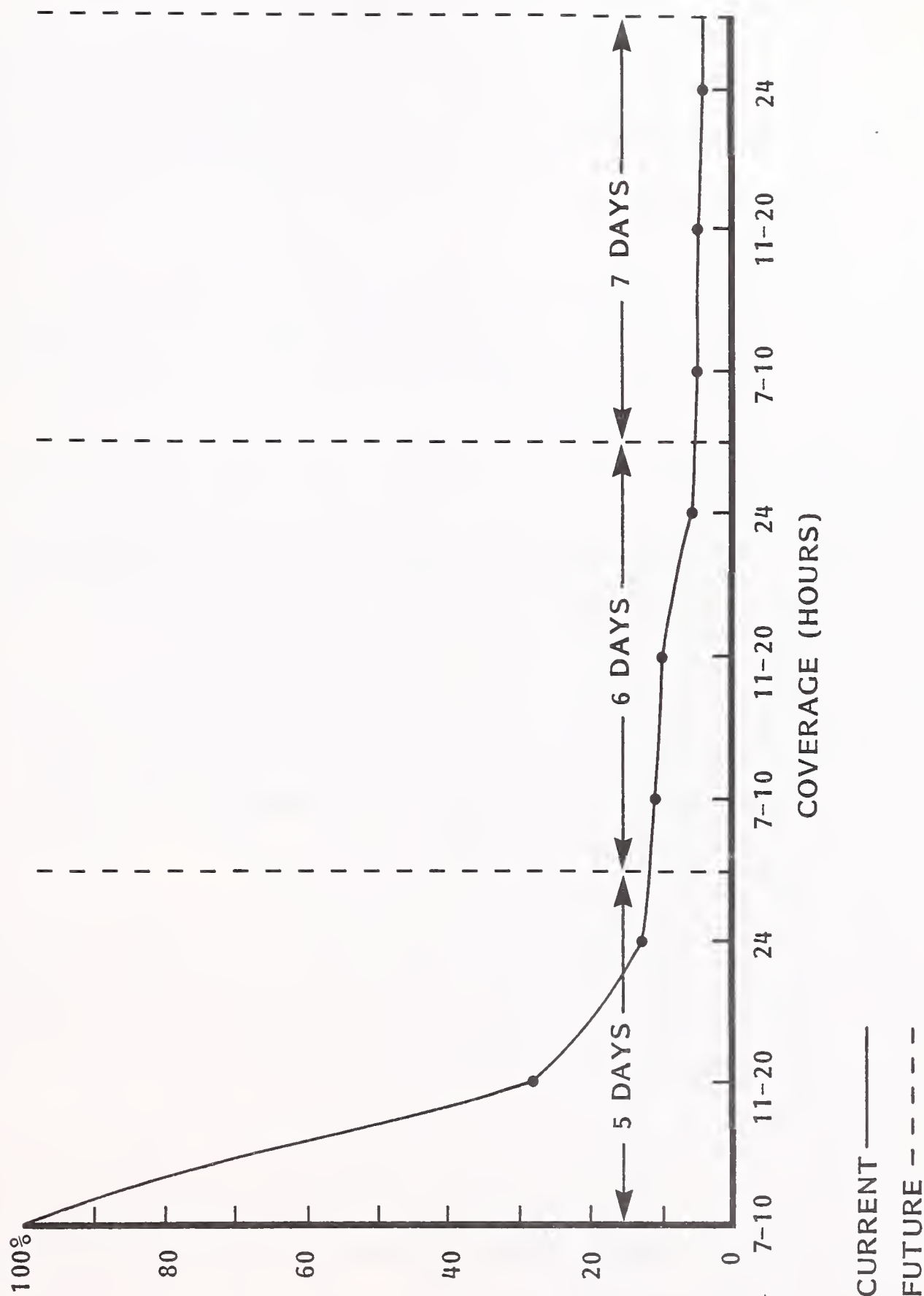
EXHIBIT III-52

MAINTENANCE CONTRACT VERSUS TIME AND MATERIALS USAGE IN FRANCE

CATEGORY	CONTRACT		TIME & MATERIALS	
	NUMBER	PERCENT	NUMBER	PERCENT
MAINFRAMES	63	100%	0	0%
SMALL BUSINESS COMPUTERS	17	100	0	0
MINICOMPUTERS	23	100	0	0
PERIPHERALS	25	100	0	0
TERMINALS	42	100	0	0
SYSTEMS SOFTWARE	37	100	0	0
APPLICATIONS SOFTWARE	7	70	3	30
TOTAL	214	99%	3	1%

EXHIBIT III-53

CUMULATIVE MAINTENANCE COVERAGE REQUIREMENTS IN FRANCE



3. MEAN TIME TO RESPOND AND REPAIR

a. As Perceived By Users

- Plots of ideal, actual and minimum acceptable levels of maintenance performance for users' response and repair times are graphically illustrated in Exhibits III-54 through III-59. There are two separate graphs for each type of hardware equipment.
- As is apparent from Exhibit III-54, mainframe users are clearly not happy with their current response time, as 80% are not achieving what they consider minimally acceptable.
- However, 91% are receiving a response time within four hours.
- Users are slightly less displeased with actual repair time; for 82%, four hours is the actual time to repair.
- Users of small business machines, shown in Exhibit III-55, appear to have a low tolerance level since, for both response and repair times, there is little difference between the curves representing ideal time and minimum acceptable performance level.
- Current performance falls below both of these - especially in the case of response time. The largest gap appears at 46% of users actually receiving a three-hour response time, although 74% gave this as their minimum acceptable level, and 83% held three hours as their ideal.
 - The actual repair time for 88% of the respondents' machines is eight hours. Ninety percent feel this is the minimum tolerable performance. Ideally, 100% would like to have the repair effected by that time.
- The discontent continues with minicomputer failures, as Exhibit III-56 shows.

MAINFRAME MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR -
MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN

FRANCE

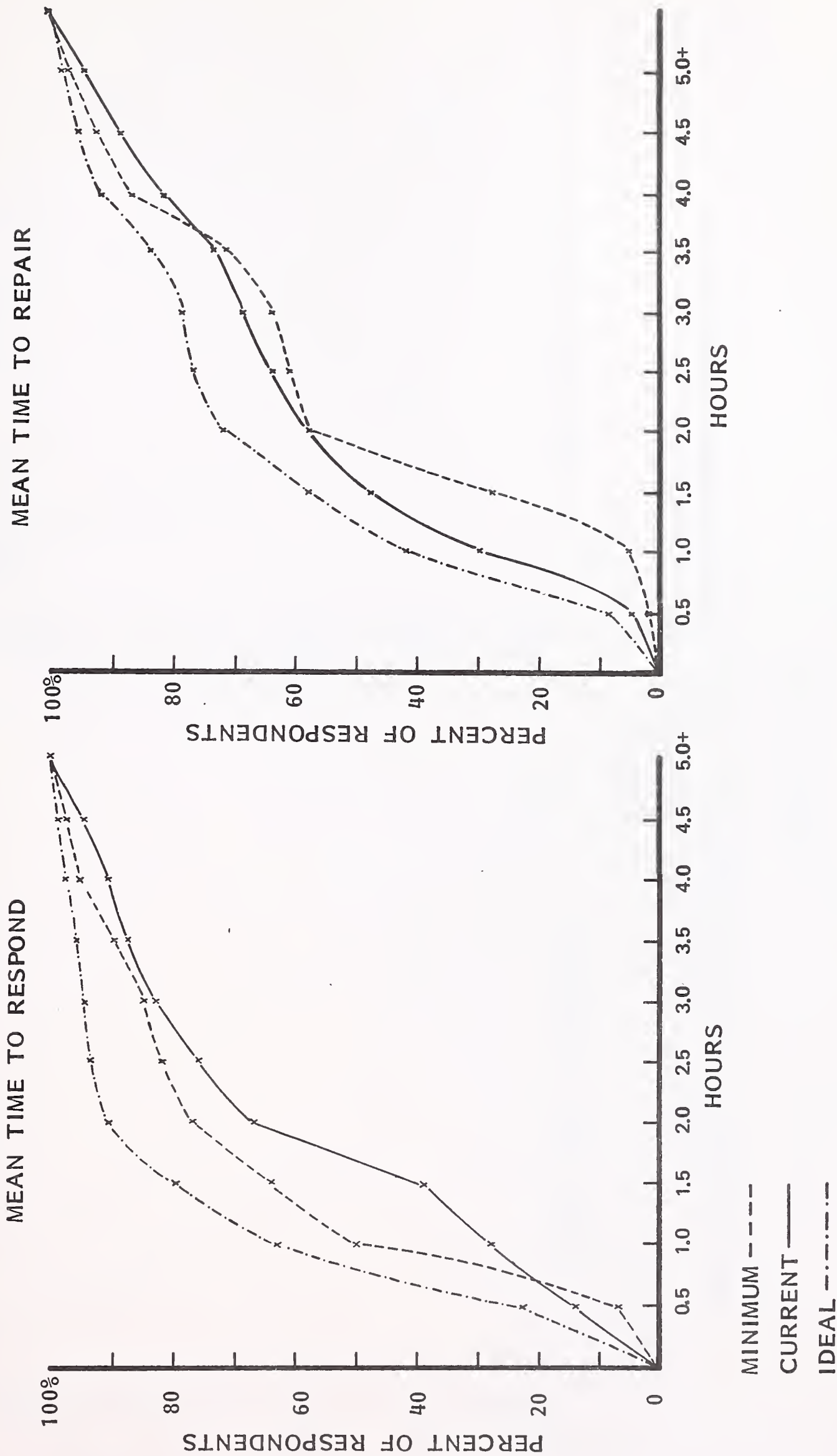
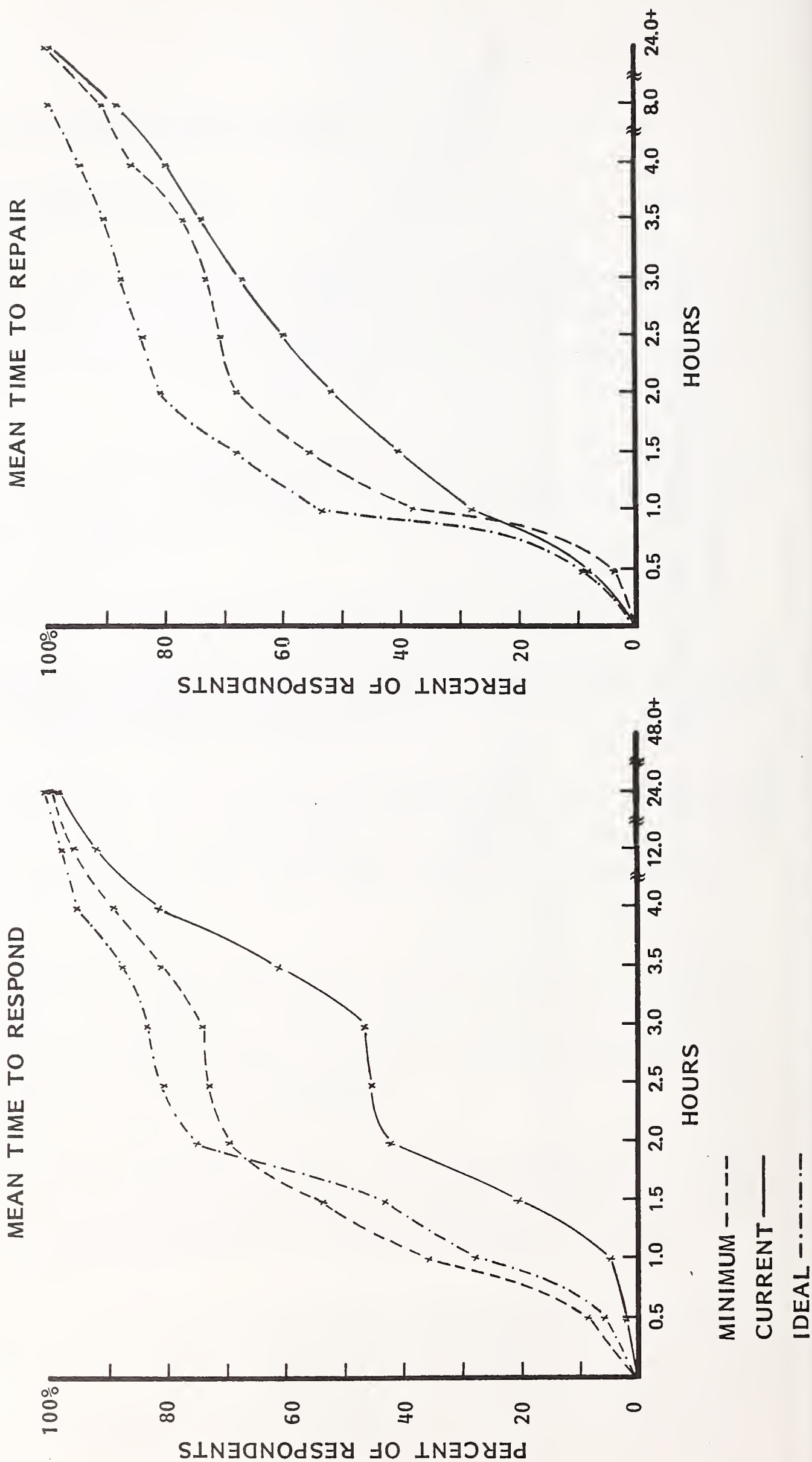


EXHIBIT III-55

SMALL BUSINESS MACHINE MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR --
MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN
FRANCE



MINICOMPUTER MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR -
MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN
FRANCE

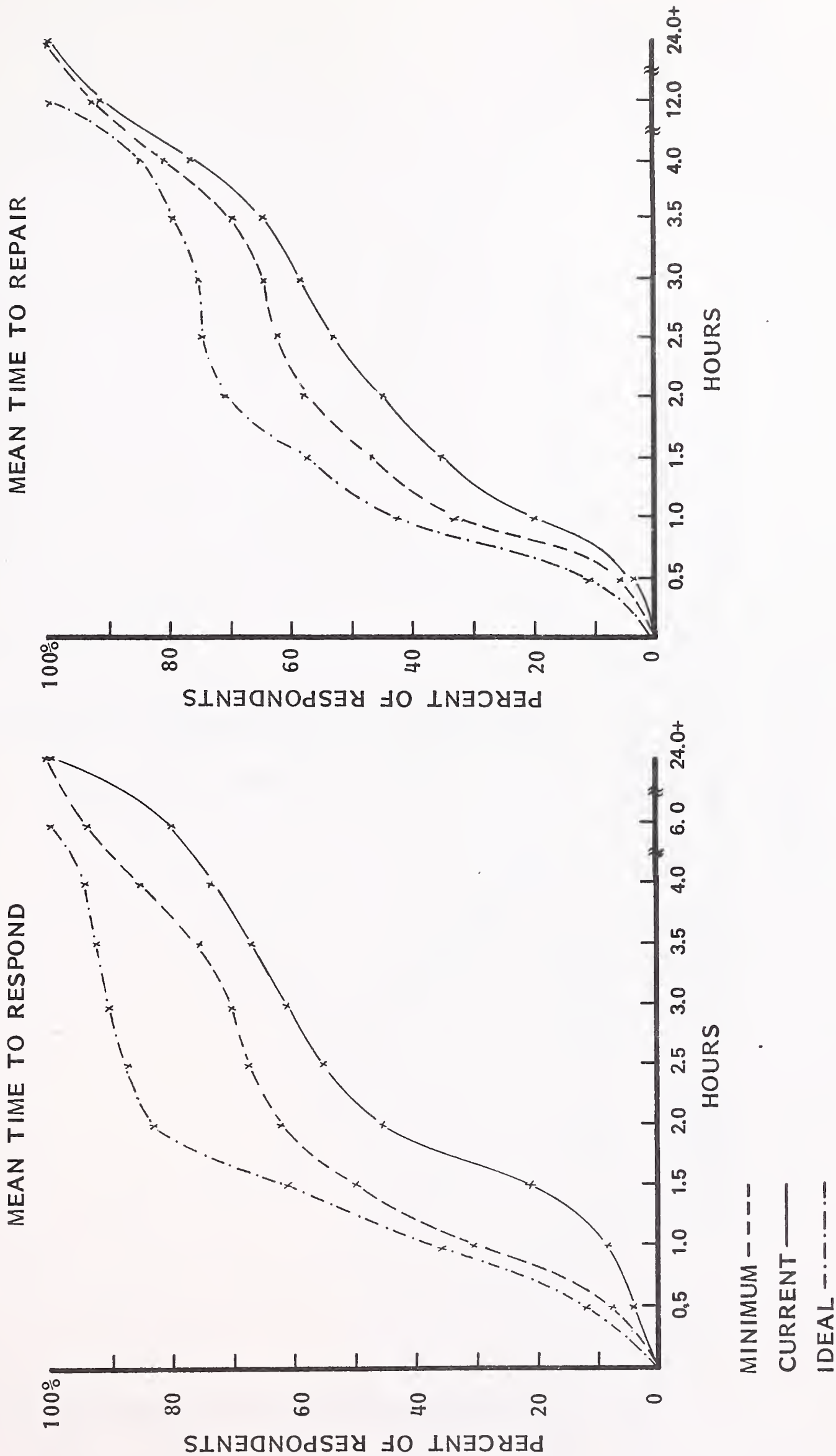
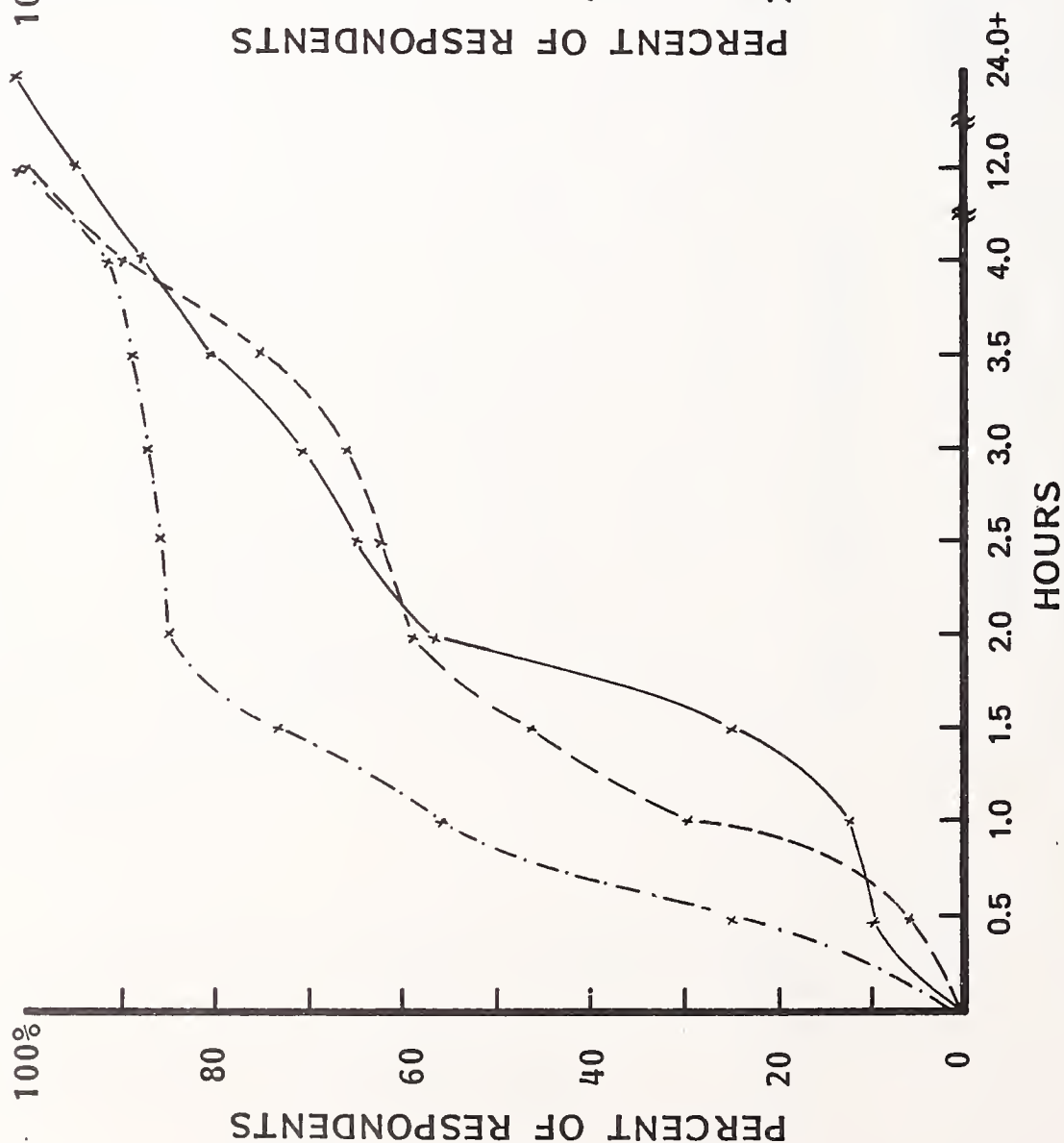


EXHIBIT III-57

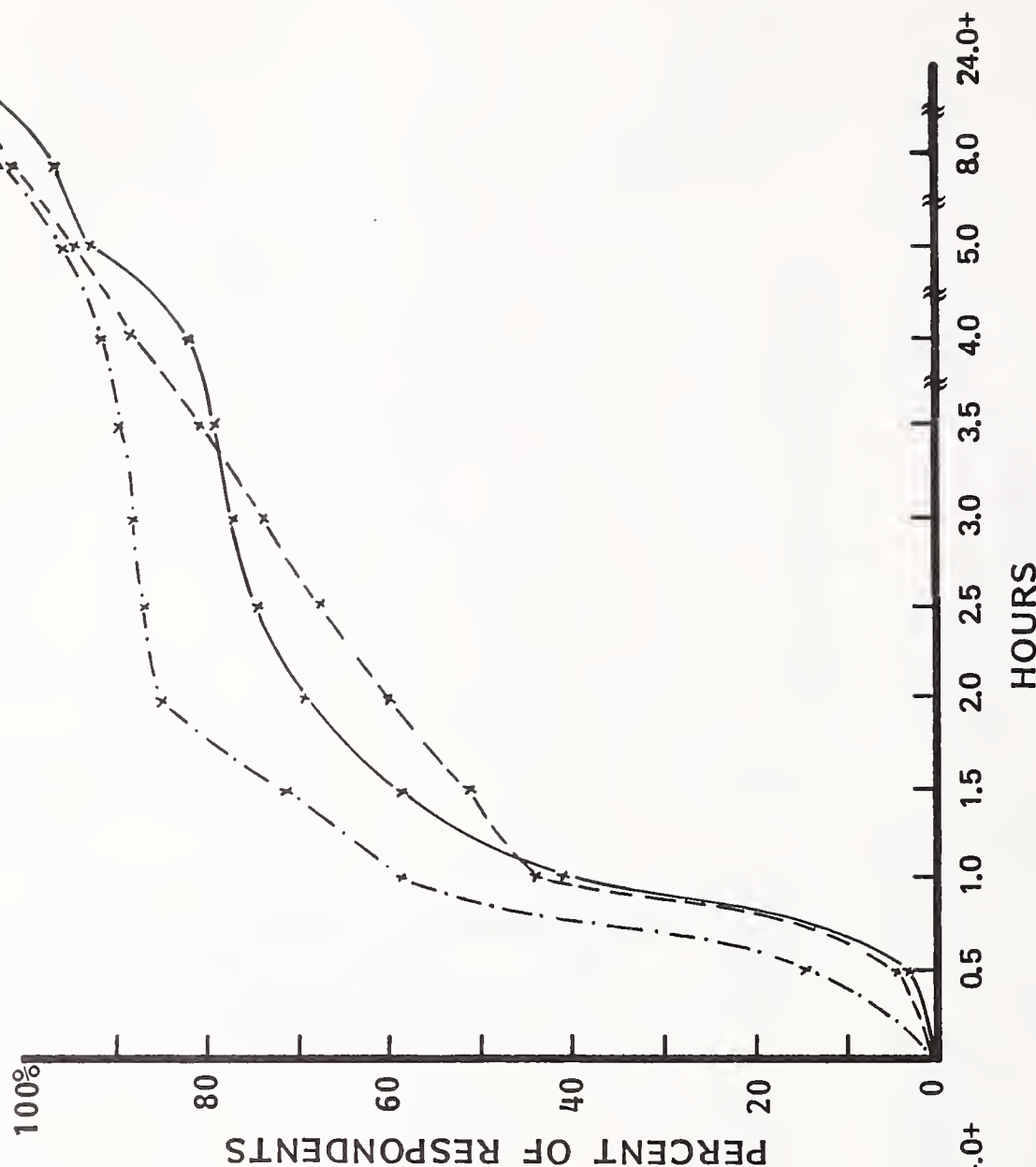
PERIPHERAL MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR - MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN

FRANCE

MEAN TIME TO RESPOND



MEAN TIME TO REPAIR



MINIMUM ----

CURRENT —

IDEAL -.-.-

TERMINAL MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR -
MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN
FRANCE

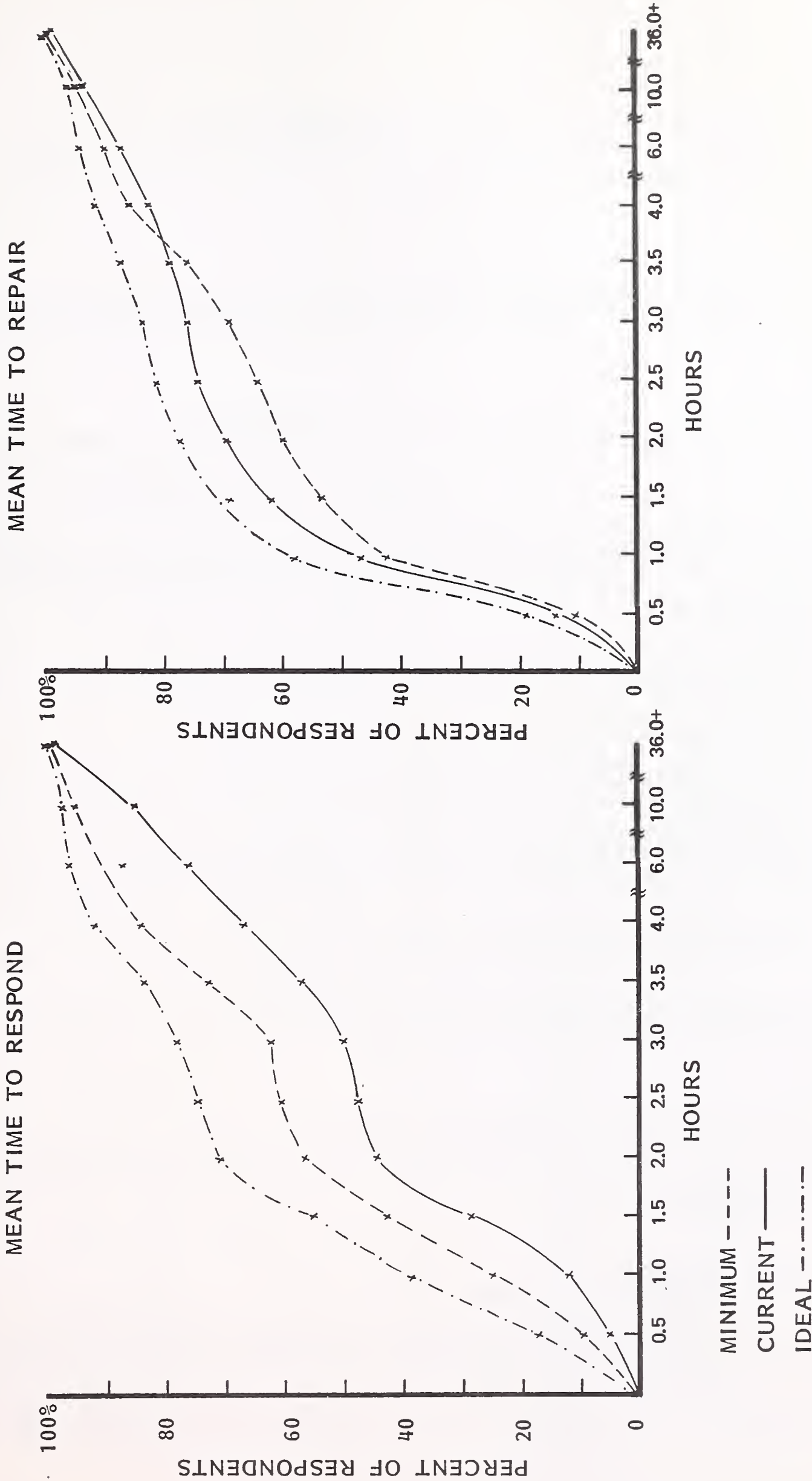


EXHIBIT III-59

USERS' WILLINGNESS TO PAY MORE FOR IDEAL MAINTENANCE IN FRANCE

HARDWARE

CATEGORY	WILLING		NOT WILLING		AMOUNT WILLING TO PAY	
	NUMBER	PERCENT	NUMBER	PERCENT	AVERAGE PERCENT	RANGE
MAINFRAMES	28	45%	34	55%	16%	0.5-100%
SMALL BUSINESS MACHINES	11	58	8	42	20	5-100
MINICOMPUTERS	10	45	12	55	24	5-100
PERIPHERALS	10	48	11	52	21	5-100
TERMINALS	18	40	27	60	17	5-100
TOTAL	77	46%	92	54%	20%	0.5-100%

SOFTWARE

CATEGORY	WILLING		NOT WILLING		AMOUNT WILLING TO PAY	
	NUMBER	PERCENT	NUMBER	PERCENT	AVERAGE PERCENT	RANGE
SYSTEMS SOFTWARE	14	40%	21	60%	19%	5-100%
APPLICATIONS SOFTWARE	6	46	7	54	45	5-100
TOTAL	20	42%	28	58%	32%	5-100%

- The ideal response level for all respondents is a maximum of six hours; 80% are actually experiencing this, but for 94%, this is the least service they would expect.
- Once the call has been responded to, the engineer should ideally take no longer than 12 hours to repair the fault. Ninety-three percent are both achieving this and regarding it as the longest acceptable time.
- The curves representing response and repair times concerning peripheral equipment in Exhibit III-57 are far more erratic.
- Again the French expect better service than they are receiving, but there is not always a difference between their ideal and minimum acceptable level.
- For response times, all three conceptions draw close, and the majority of respondents agree on a maximum of four hours.
 - A similar position applies to repair times, 83% to 87% of the respondents agreeing on up to five hours. A total of nine hours' downtime for peripherals is a general maximum. However, actual repair times for some users can be as long as 48 hours.
- Exhibit III-58 shows that mean times to respond as perceived by terminal users continue the trend established in these exhibits, with a minimum standard only slightly lower than the ideal and with current time received lying below both curves.
 - After six hours, 76% of respondents' calls have been answered. Eighty-seven percent regard this as the longest tolerable time to wait, and 97% feel this is a maximum ideal.
 - For the machines to be repaired, though, all three curves run parallel very closely together for repairs within the first hour, and thereafter do not vary by more than 17%, with the current time received actually

falling between the ideal and the minimum performance curves for most of the way.

- As with response times, six hours is a general maximum repair time; 87% receive this, 94% consider it ideal.
- As shown in Exhibit III-59, to achieve their high ideals, 46% of respondents are prepared to pay an average of 20% extra for their maintenance service, as expected from the low standard in response time achieved on small business machines. This is the area where the highest percentage, 58%, indicated that they would be prepared to pay a premium. The lowest percentage of users (40%) who would do so are terminal users, who, according to repair times shown in Exhibit III-58, are the most satisfied.
- Some 42% of the respondents are also prepared to pay 32% more for an improvement in response and repair times on software maintenance.

b. Users' Satisfaction With Response and Repair Times

- Exhibit III-60 shows users' satisfaction and dissatisfaction with each equipment type, for both response and repair times.
 - Consistent with observations already noted, the lowest level of satisfaction concerning response times is held by users of small business machines, with 19% of these users achieving their ideal.
 - Terminal users are the most content with repair time received, as 46% actually reach their ideal. Conversely, they have the lowest level of dissatisfaction, at 25%.
- This is a much lower general level of satisfaction than that enjoyed by U.K. respondents, which suggests that the minimum acceptable curves displayed in Exhibits III-54 to III-58 are to be seriously interpreted, and not regarded merely as high, unattainable ideals.

EXHIBIT III-60

USERS' SATISFACTION/DISSATISFACTION WITH THEIR MAINTENANCE SERVICE IN FRANCE

RESPONSE TIMES

EQUIPMENT TYPE	SATISFIED*		NOT SATISFIED**	
	NUMBER	PERCENT	NUMBER	PERCENT
MAINFRAMES	23	29%	32	41%
SBCs	5	19	16	62
MINICOMPUTERS	8	26	17	55
PERIPHERALS	7	24	12	41
TERMINALS	21	36	30	52
SYSTEMS SOFTWARE	13	32	23	56
APPLICATIONS SOFTWARE	6	33	11	61

REPAIR TIMES

EQUIPMENT TYPE	SATISFIED*		NOT SATISFIED**	
	NUMBER	PERCENT	NUMBER	PERCENT
MAINFRAMES	21	27%	28	36%
SBCs	11	44	13	52
MINICOMPUTERS	6	19	16	52
PERIPHERALS	10	37	9	33
TERMINALS	26	46	14	25
SYSTEMS SOFTWARE	10	28	19	53
APPLICATIONS SOFTWARE	6	35	10	59

*SATISFIED = THOSE RESPONDENTS CURRENTLY ATTAINING - OR IMPROVING ON - THEIR IDEALS

**NOT SATISFIED = THOSE RESPONDENTS WHOSE CURRENT AVERAGE FALLS BELOW THEIR
MINIMUM LEVEL OF SERVICE

4. USERS' SATISFACTION WITH MAINTENANCE

- Exhibit III-61 shows overall maintenance ratings as perceived by users.
- French maintenance vendors, although falling behind their clients' expectations in terms of response and repair times, generally provide very satisfactory service.
- A large percentage of users regard the quality of maintenance on their equipment as high - above 50% is achieved in every category except that of minicomputers.
 - No category apart from minicomputers received a low rating by more than 20% of users. Even the quality of software maintenance is more than satisfactory in France.
- Users' ratings of hardware and software vendors are supplied in Exhibits III-62 and III-63 respectively. The total number of mentions and average ratings are given for each vendor.
 - The French organisation YREL, mentioned by three respondents, received the highest average possible - 5 points on a scale of 1-5 - concerning hardware equipment. High marks were also given to CDC and NCR (although only from a single respondent each) and to Siemens, Datasaab, Hewlett-Packard, Sems, Transac and IBM.
 - ICL, Memorex and Philips are amongst those vendors who scored average or near average ratings, and the only vendors to score less than 3 points were MSI and Wang.
 - Top-scoring software vendors are Line Data, Solva and Philips.

EXHIBIT III-61

USERS' SATISFACTION WITH MAINTENANCE IN FRANCE

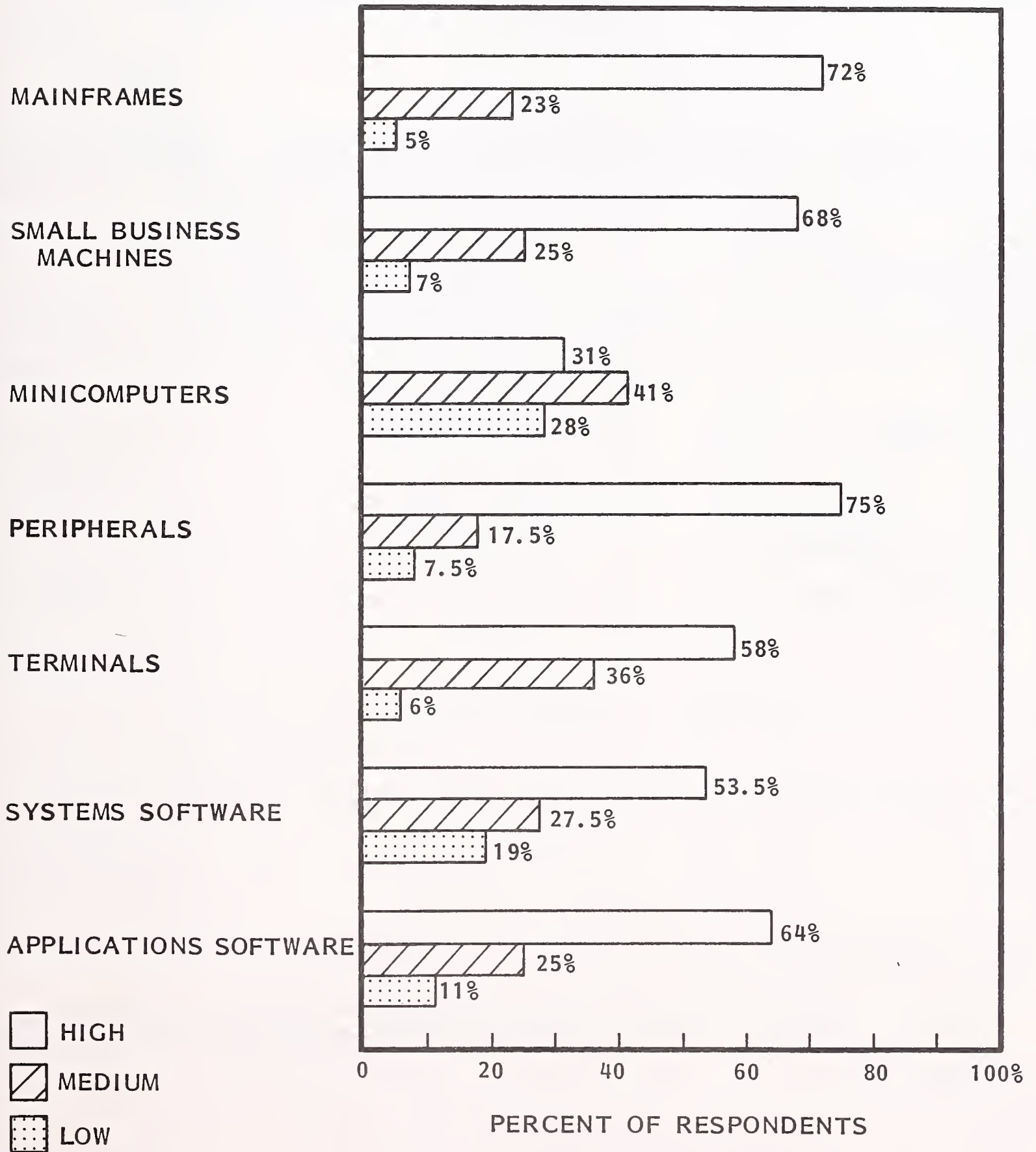


EXHIBIT III-62

**USERS' RATINGS OF HARDWARE MAINTENANCE VENDORS
IN FRANCE**

VENDOR	RATING		VENDOR	RATING	
	TOTAL NUMBER OF MENTIONS	AVERAGE RATING		TOTAL NUMBER OF MENTIONS	AVERAGE RATING
BASF	12	3.58	MEMOREX	12	3.58
BURROUGHS*	6	3.17	MSI	2	2.50
CDC*	1	4.50	NCR*	1	4.00
CMC	3	3.67	OLIVETTI	5	3.40
DATASAAB*	2	4.00	PHILIPS	4	3.50
DEC	2	3.50	PRIME	2	3.00
HEWLETT-PACKARD*	2	4.00	SEMS	2	4.00
HONEYWELL-BULL*	53	3.10	SIEMENS*	5	4.20
IBM*	89	3.99	STC	2	3.50
ICL*	16	3.56	TEXAS INSTRUMENTS	4	3.00
ITT	5	3.20	TRANSAL	2	4.00
MATRA	5	3.20	WANG	2	2.50
MDS	5	3.80	YREL	3	5.00

AVERAGE RATING = 3.56

N.B.: EXCEPT FOR MAINFRAME VENDORS, ONLY THOSE VENDORS MENTIONED AT LEAST TWICE HAVE BEEN LISTED; SINGLE MENTIONS HAVE BEEN OMITTED. HOWEVER, THEY AMOUNTED TO A TOTAL OF 17 VENDORS.

*MAINFRAME VENDOR

EXHIBIT III-63

USERS' RATINGS OF SOFTWARE MAINTENANCE VENDORS IN FRANCE

VENDOR	RATING		VENDOR	RATING	
	TOTAL NUMBER OF MENTIONS	AVERAGE RATING		TOTAL NUMBER OF MENTIONS	AVERAGE RATING
AGI PEC-RHN	2	4.00	LINE-DATA	2	5.00
BURROUGHS*	2	3.00	PHILIPS*	1	4.50
CAP SOGETI	3	3.30	PRIME*	1	4.00
CGI	2	4.00	SEMS	2	1.00
HONEYWELL- BULL*	17	3.41	SLIGOS	2	1.50
IBM*	37	3.51	SOLVA	2	5.00
ICL*	5	3.10	STERIA	2	3.50

AVERAGE RATING = 3.49

N.B.: EXCEPT FOR COMPUTER VENDORS, ONLY THOSE VENDORS MENTIONED AT LEAST TWICE HAVE BEEN LISTED; SINGLE MENTIONS HAVE BEEN OMITTED. HOWEVER, THEY AMOUNTED TO A TOTAL OF 18 VENDORS

*COMPUTER VENDOR

- IBM and Honeywell-Bull are around the average mark, and low scores were reached by the French companies Sems, a mini manufacturer, and Sligos, a software house.
- No respondent has thus far replaced mainframe equipment as a result of poor maintenance, as shown in Exhibit III-64.
- Higher percentages have, however, replaced small business systems/minis and peripherals than holds for Western Europe in general.
- A breakdown of the vendors affected appears in Exhibit III-65. Although IBM was mentioned by three respondents, this can be expected in view of IBM's high market proportion.
- Only one respondent claimed to have replaced IBM as a software maintenance vendor, compared with three mentions of Honeywell-Bull, as shown in Exhibit III-66.

5. USERS' SATISFACTION WITH PERSONNEL AND PROCEDURES

- Respondents were asked for their assessment of how the quality of field engineers and of first-line managers had changed compared with last year, and the results are tabled in Exhibit III-67.
- The French were far more reticent than their U.K. counterparts in supplying comments to substantiate their assessments.
- The 60% and 58% of respondent users who could determine no significant change in the quality of engineers or first-line managers were divided as to whether the 'same' quality applied to a continuing satisfactory standard, or no improvement on a previously poor one.
- 'A technician being on-site, service on the control computer remains good.'

EXHIBIT III-64

NUMBER OF VENDORS REPLACED
DUE TO POOR MAINTENANCE IN
FRANCE

TYPE OF HARDWARE	FRANCE	TOTAL WEST EUROPE
MAINFRAME	0.0%	4%
SBS/MINI	30.8	24
PERIPHERAL	61.5	52
TERMINAL	7.7	20

TOTAL NUMBER OF RESPONDENTS IN FRANCE = 13

EXHIBIT III-65

HARDWARE VENDORS REPLACED DUE TO POOR MAINTENANCE IN FRANCE

VENDOR	EQUIPMENT REPLACED	NUMBER OF MENTIONS
IBM	PERIPHERAL	3
SEMS	MINICOMPUTER	2
STC	PERIPHERAL	2
BURROUGHS	PERIPHERAL	1
OLIVETTI	MINICOMPUTER	1
ICL	TERMINAL	1
PHILIPS	SMALL BUSINESS COMPUTER	1
HONEYWELL - BULL	PERIPHERAL	1
BASF	PERIPHERAL	1

EXHIBIT III-66

SOFTWARE VENDORS REPLACED
DUE TO POOR MAINTENANCE IN
FRANCE

VENDOR	NUMBER OF RESPONDENTS
HONEYWELL-BULL	3
IBM	1
ICL	1
PHILIPS	1

TOTAL RESPONSE = 6

EXHIBIT III-67

CHANGES IN THE QUALITY OF FIELD
ENGINEERS AND FIRST-LINE MANAGERS IN
FRANCE

CHANGE	FIELD ENGINEERS	FIRST-LINE MANAGERS
SAME	60%	58%
BETTER	25	23
POORER	15	19

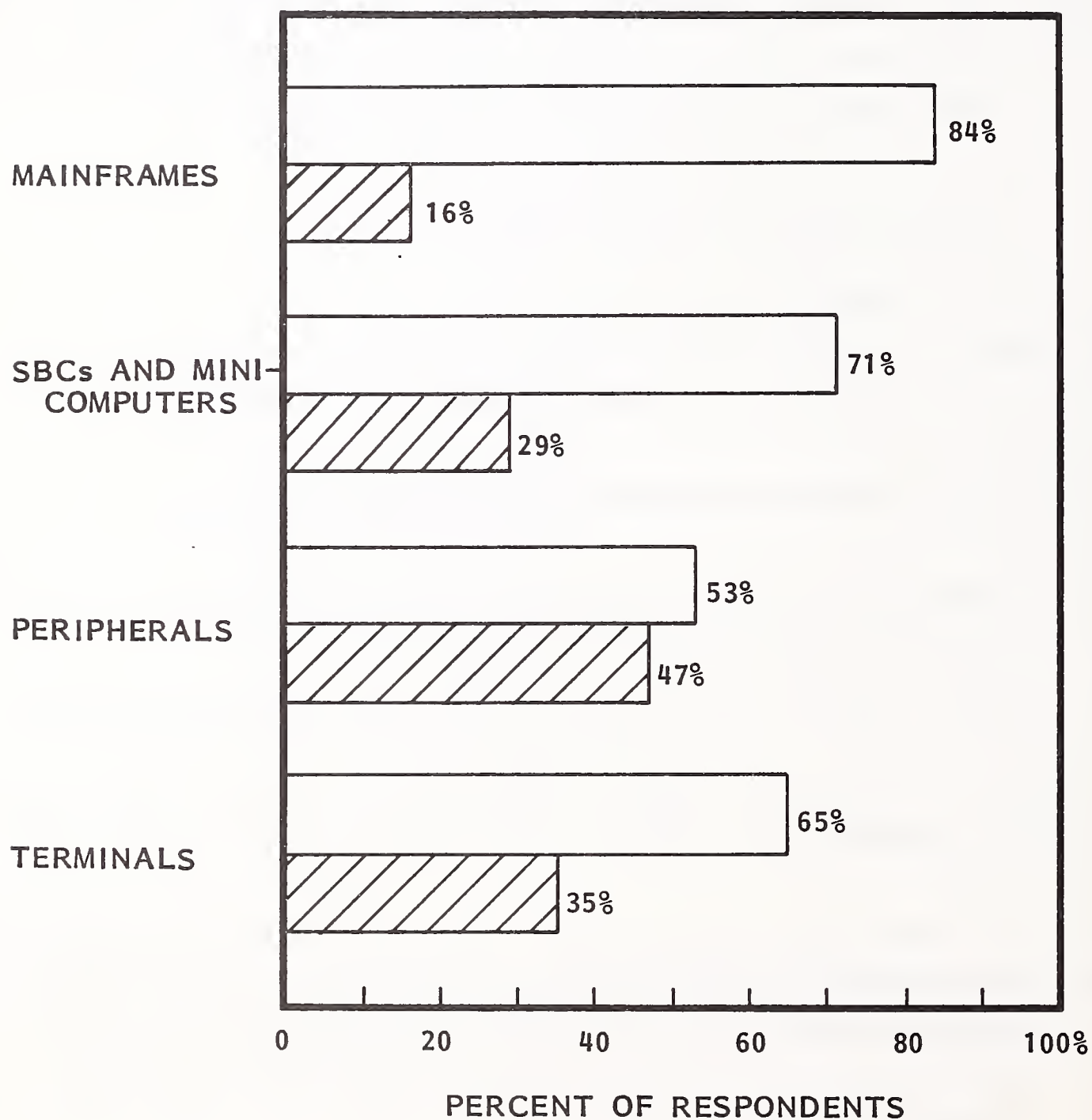
- 'For our small system, we have always had reliable maintenance in the half-day following our call.'
 - 'Steady quality for hardware as for software.'
 - 'In spite of efforts to maintain inspections by IBM, results are too feeble.'
 - 'No improvement in service, in spite of change of supplier.'
 - 'No improvement, bearing in mind the aging of the mainframe and disappearance of personnel capable of maintaining it.'
- This latter remark is an echo of the British respondents' complaint concerning older equipment, which is further borne out by an additional French respondent.
 - 'Same quality in general, but slight tendency towards poorer as better engineers are being snapped up by mini and micro vendors.'
- The 15% of respondent users who felt that the quality of engineers had declined, and the 19% who said the standards of management had worsened, put the blame on a general lack of training and incentives for engineers, and largely on a lack of engineers themselves.
 - This echos the problem of the U.K. engineers who concentrate their training and efforts on recent models to the detriment of older equipment.
 - Respondents are less reticent in their comments when complaining.

- . 'Change of maintenance team; the new one has a high percentage of new elements.'
- . 'Less qualified staff; smaller stocks of spare parts.'
- . 'Insufficient engineers.'
- . 'The present engineers are much less masters of their trade than the previous ones.'
- . 'The whole system was once stopped for 24 days.'
- . 'Change in management and less attention to clients.'
- It seems that the change, either of the engineers themselves, or in management, is merely a question of luck:
 - . 'The management is better after a change of personnel with IBM.'
 - . 'A change of management has improved our service.'
 - . 'The engineer is more competent.'
 - . 'Personnel are better trained and maintenance tests more suitable.'
- Other reasons for improvements included better response time and speedier diagnostics, the replacement of defective parts almost immediately, or in the case of one, possibly naive, respondent:
 - 'The Tandem organisation is growing and the service can only get better.'

- From the above responses, it emerges that training of engineers is a key factor in how a user feels about general maintenance service.
6. USERS' ATTITUDES AND CONCERNS ABOUT UNBUNDLING MAINTENANCE
- Over 50% of respondent users prefer a fixed pricing structure when contracting for maintenance, especially for critical equipment such as mainframes. Eighty-four percent prefer this system over an incremental maintenance charge based on service provided, as seen in Exhibit III-68.
 - The main reasons for this choice were:
 - Frequency of breakdowns.
 - The economics make better sense.
 - Convenience - ease of budgeting, administration, etc.
 - IBM was seen to charge very highly for non-contract work.
 - 'The entire cost of maintenance is less than individual charges.'
 - 'Paying for a specialist (370/148 for example) is always very burdensome.'
 - An incremental charge system was favoured more for peripherals and terminals, but still not by more than 50% of users. However, those with this system believed the quality of service provided to be superior. It was generally felt that it was a more practical system for reliable equipment, non-critical or duplicate systems.
 - 'On this equipment there has only been one breakdown since November 1977.'

EXHIBIT III-68

UNBUNDLING OF MAINTENANCE BY EQUIPMENT TYPE IN
FRANCE



- ☐ FIXED PRICING STRUCTURE
- ☒ INCREMENTAL PRICING STRUCTURE

- 'Terminal equipment is more reliable and the cost of carrying replacements is not great.'
- Users were asked to what extent they were currently, or would consider, performing their own maintenance. Exhibit III-69 examines the responses.
 - Overwhelmingly, user responses indicated that they were not currently performing any of the five tasks suggested. A slight exception is the performance of diagnostics. Thirty-seven percent of respondents claim to currently carry out this function.
 - In most cases, too few respondents were able to mention cost savings that they might expect to receive for performing these functions. Thus, a reliable judgement cannot be recorded. For example, one respondent mentioned an actual savings of 80% by carrying equipment to the depot for repair. That response can be compared to the 7% of users willing to consider depot maintenance and who anticipate a savings of 50%.
- Most respondents are unwilling to keep spare parts on-site. Only 21% is prepared to do so and then only:
 - 'If service is improved without too great a financial disadvantage.'
- The prime factors against storing spares were price and that too great a diversity of parts would be needed. Furthermore, spare parts fast become out of date, and storage and stock control create other problems.

7. USERS' ATTITUDES TOWARDS THIRD-PARTY MAINTENANCE

- Only a single respondent in France claimed to be using third-party maintenance: the reason was a cost savings of 15%.

EXHIBIT III-69

USERS' WILLINGNESS TO PERFORM MAINTENANCE ACTIVITIES IN
FRANCE

TYPE OF USER	INSTALL EQUIPMENT	PERFORM DIAGNOSTICS	HARDWARE MAINTENANCE	SOFTWARE MAINTENANCE	DEPOT MAINTENANCE
CURRENTLY PERFORMING	8%	37%	9%	16%	6%
PERCENT SAVINGS	7	25	ND	28	80*
NOT CURRENTLY PERFORMING	92	63	91	84	94
NOT PERFORMING - WOULD NOT CONSIDER	98	91	93	92.5	93
WOULD CONSIDER	2	9	7	75	7
ANTICIPATED PERCENT SAVINGS	30*	50*	5*	ND	50

ND = NO DATA * COST SAVINGS ONLY MENTIONED BY ONE RESPONDENT.

- Exhibit III-70 lists, in descending order, the reasons given by non-users of third-party maintenance for considering this type of service and below, for not using it.
 - Cost savings is the principal factor for users prepared to consider third-party maintenance.
 - Most users not prepared to consider the idea are content with their current suppliers, believe the manufacturer should be responsible for its own equipment or simply do not believe it exists in their neighbourhood. One respondent did not consider the idea:
 - 'Because I have not been approached.'
- Those who would consider it look to an average cost savings of 18.5%.

8. USERS' SENSITIVITY TO MAINTENANCE PRICING

- When asked what they planned to do about rising maintenance costs, over one-third of respondents replied that there was nothing they could really do to combat the situation.
 - A few suggested reducing coverage, changing equipment and/or vendor, or intervening through a users' club.
- Other solutions were to carry out their own maintenance, increase productivity or study the results of remote diagnostics.
- Responses were varied as to when rising costs become a problem.
 - 'It doesn't.'
 - 'Now.'

EXHIBIT III-70

THIRD-PARTY MAINTENANCE IN FRANCE: NON-USERS' PERCEPTIONS AND REASONS FOR CONSIDERING/NOTCONSIDERING

REASONS FOR CONSIDERING THIRD PARTY MAINTENANCE	NUMBER OF RESPONDENTS
COST SAVINGS	8
BETTER SERVICE EXPECTED	5
COMPETITION	2
TIME SAVINGS	1
BETTER AVAILABILITY	1
MULTIVENDOR INSTALLATION	1
REMOTE SITES	1
MORE CONTROL OVER QUALITY	1
EASE OF NEGOTIATION	1

REASONS FOR NOT CONSIDERING THIRD PARTY MAINTENANCE	NUMBER OF RESPONDENTS
HAPPY WITH CURRENT SUPPLIER/SERVICE IS BETTER	11
MANUFACTURER SHOULD BE RESPONSIBLE FOR EQUIPMENT	6
DOESN'T EXIST IN FRANCE/NOT BEEN APPROACHED	6
AVOID CONFLICT IN RESPONSIBILITY	5
EASE OF OBTAINING SPARE PARTS FROM MANUFACTURER	2
INSECURITY OF THIRD PARTIES	1
LACK OF KNOWLEDGE BY THIRD PARTIES	1
THIRD PARTIES CANNOT KEEP UP TO DATE	1
THIRD-PARTY SYSTEM HASN'T PROVED ITSELF YET	1
LEGALLY IMPOSSIBLE AT PRESENT	1
DIFFICULT TO DISTINGUISH HARDWARE AND SOFTWARE	1
DIFFICULT TO FIND THIRD PARTY SUFFICIENTLY WELL ESTABLISHED, STOCKED AND WITHOUT GEOGRAPHICAL DIFFICULTIES	1

- 'When the cost of maintenance is around 18% of the value of the equipment.'
 - 'If hardware costs do not continue to fall.'
 - 'Fairly quickly, as maintenance costs are increasing more than the use of equipment justifies.'
 - 'When the manufacturer puts pressure on the client to replace equipment by raising maintenance costs.'
 - 'Beyond an increase of 7.8%.'
 - 'If maintenance exceeds 30%.'
 - 'When these expenses exceed 30% of the sum total of rent, service offered (in time to respond and repair) they are beyond tolerable limits.'
- The table below is an indication of how users perceive their maintenance costs to have risen in the past year over previous years.

	<u>Change in Cost</u>	<u>Average</u>	<u>Change Relative to Value of Eqpt.</u>	<u>Average</u>
Increased	76.5%	20%	51%	11%
Same	4.0	13	13	
Decreased	<u>19.5</u>	5	<u>36</u>	50
	100.0%		100%	

9. USERS' ATTITUDES TOWARDS ELIMINATING PREVENTIVE MAINTENANCE

- A high percentage of respondent users, 74%, would not eliminate preventive maintenance for any cost savings whatsoever. However, as Exhibit III-71 indicates, PM is still seen as being a less important maintenance factor than both mean time to respond and to repair.
 - On a scale of 1-5, PM scored 3.2 as an average rating, compared with 4.2 points reached by the other two factors.

10. USERS' ATTITUDES TOWARDS REMOTE DIAGNOSTICS

- Most users of a remote diagnostic capability considered their service had improved as a result. The breakdown of responses follows:

- Same quality	22%
- Improved quality	72
- Poorer quality	<u>6</u>
	100%
- The average time the facility had been in use among users was 13.8 months. An additional four users will start at the end of 1980 or early 1981.
 - Mainframe equipment is supplied by the following vendors:

EXHIBIT III-71

IMPORTANCE OF FIELD MAINTENANCE
CHARACTERISTICS - USERS' RATINGS IN
FRANCE

FACTOR	PERCENT HIGH RATINGS	AVERAGE RATING*
MEAN TIME TO RESPOND	76	4.2
MEAN TIME TO REPAIR	84	4.2
PREVENTIVE MAINTENANCE	45	3.2

RATED ON A SCALE OF 1 TO 5

.	IBM	48%	of remote diagnostic users				
.	Honeywell-Bull	30%	"	"	"	"	
.	DEC	5%	"	"	"	"	
.	Other*	<u>17%</u>	"	"	"	"	
		100%					

*Other includes Siemens, ICL, Matra, CIT Alcatel, CSL, Yrel, Total-Cyncom and Telecom.

- Non-users were asked for their reactions if offered a remote diagnostic facility. No single respondent was against the idea; in fact 79% of non-users were in favour. The remainder were either hesitant, non-committal or didn't know.
 - 'Positive, as it means a better maintenance service and perhaps a reduction in cost.'
 - 'Good - as long as the repair itself will be even faster.'
 - 'Favourable as long as we can get an engineer quickly if there are difficulties.'
 - 'Favourable as these long breakdowns are often due to bad information being passed to the maintenance engineers.'
 - 'O.K. if direct service is not reduced.'
 - 'We'd have to consider the cost against the quality of service.'

II. USERS' PERCEPTIONS OF ESCALATION PROCEDURES

- The views of current and potential users of escalation procedures are expressed in Exhibit III-72.
 - Only 15% of respondents, 13 out of a total of 86, are currently provided with this facility by their vendors. None of these felt the service had decreased in quality as a result; most considered it to have remained the same.
 - Of those without this facility, most did not believe it would improve their service: 51% were against, 14% thought it would.
- Claimed advantages of the escalation approach vary:
 - 'A breakdown can never last very long.'
 - 'It compensates for the monetary erosion suffered by different components.'
 - 'No effect.'
- Those users currently without the facility remarked:
 - 'Repairs out of hours are at very high prices.'
 - 'IBM doesn't provide it, but should.'
 - (This last comment is inaccurate, as the majority of users of escalation procedures are IBM users.)

EXHIBIT III-72

USERS' SATISFACTION WITH ESCALATION PROCEDURES IN FRANCE

COMMENT	RESPONDENTS WITH A FORMAL ESCALATION PROCEDURE		RESPONDENTS WITHOUT A FOR- MAL ESCALATION PROCEDURE	
	NUMBER	PERCENT	NUMBER	PERCENT
IMPROVED	2	15%	14	19%
SAME	8	62	51	70
POORER	0	0	0	0
NON COMMITTAL/ DON'T KNOW, ETC.	3	23	8	11
TOTALS	13	100%	73	100%

VENDORS PERCEIVED AS OFFERING FORMAL ESCALATION PROCEDURES

VENDOR	NUMBER OF RESPONDENTS
IBM	7
HONEYWELL-BULL	1
LOGABAX	1
MATRA	1
PRIME	1
SEMS	1
TANDEM	1

- A separate question was put to respondents asking whether they would prefer to buy products from a vendor who provided a formal escalation procedure as part of their maintenance activities. Only one-quarter of the respondents replied that they would.

12. EFFECTIVENESS OF NEW MAINTENANCE TECHNIQUES INTRODUCED BY VENDORS

- The most effective new maintenance techniques mentioned included:
 - A separation of rental and maintenance of software - the organisation is better.
 - More back-up equipment - as hardware costs fall.
 - Centralisation of telephone calls.
- Only little effect was enjoyed by those whose vendors sought to get users' own personnel to repair small breakdowns.
- Some new techniques were most unpopular:
 - 'The horrible CSL approach on IBM. This is a disaster - software experts are no longer available on-site.'
 - 'Remote diagnostics - this has resulted in less preventive maintenance.'

13. USERS' COMMENTS ON MAINTENANCE IMPROVEMENT

- Users indicated they would like to see the following improvements made in maintenance.
 - 'Better trained and more competent engineers.'

- 'Improved spares holding.'
- 'Better repair times.'
- 'Better PM.'
- 'Better diagnostics.'
- 'Remote diagnostics.'
- 'Fewer delays in general.'
- 'Official repairs outside normal hours.'
- 'More standardisation/compatibility of machines.'
- 'Replacement and repairs on-site by exchange of modules.'
- 'Would like Philips to be able to find cause of breakdown on P700 and to act quickly.'
- 'Regional, not national, organisation.'
- 'Immediate contact with a qualified person when calling vendor to advise of breakdown.'
- 'Training of users to distinguish between hardware and software breakdowns.'
- 'Little problems are not being attended to -- vendor waits until a complete breakdown occurs.'

E. USER RESPONSES: WEST GERMANY

- The German market is somewhat different compared to the U.K. and France, although many respondents' opinions and assessments have been clearly influenced by the German economy, attitudes and relationships between employer and employee.
- Rising prices are less of a burden than they are elsewhere, and users will rarely hesitate to pay for an improvement in service. This is probably just as well, as they are also the least satisfied amongst European users, and at the same time demand the highest standards.
- German users are more willing to eliminate PM if it would save them upwards of 20% on their contracts.
- Remote diagnostics, escalation procedures and third-party maintenance are viewed with some scepticism.

I. VENDOR PROFILES

- The Germans continue the trend already observed of acquiring equipment from a variety of sources, despite the fact that IBM was cited for no less than 66% of medium to large mainframes by respondents, according to Exhibit III-73.
- It is especially significant, therefore, that Germany's home-grown, internationally respected major mainframe supplier, Siemens, only received 15.5% of the mentions. This is much less than the impacts made by the British-owned ICL in the U.K., with 38% of the market, which surpassed IBM, and the French Honeywell-Bull, with 33% of the market in France.
- Siemens' compatibility with IBM equipment could be an explanation for this: respondents were only requested to identify the principal maintenance vendor for each type of equipment.

EXHIBIT III-73

MAINFRAME MAINTENANCE VENDORS IN
WEST GERMANY

VENDOR	PERCENTAGE OF RESPON- DENTS
IBM	66%
SIEMENS	15.5
UNIVAC	6
HONEYWELL	2
CDC	1
DEC	1
ITEL	1
MDS	1
NCR	1
NIXDORF	1
OTHER	4.5

- Small business systems and minicomputers are, however, led by another German manufacturer, Nixdorf with 16%. In Appendix B, Exhibit B-14 shows the remainder to be extremely fragmented. The next highest was IBM with 9%.
- Peripherals are also supplied by a variety of vendors, with Memorex surrendering second place, after IBM, to BASF.
- There is, surprisingly, a smaller variety of terminal vendors, as shown in Appendix B, Exhibit B-16. Non-mainframe vendors amount to 46%.
- IBM's dominance of the systems software market is 49%, a match for its 66% share of the mainframe arena. Similarities in proportion also exist when relating market shares shown in Exhibits B-13 and B-17 for Siemens, Univac, CDC and MDS.
 - Exhibit B-18 shows that 59% of applications software is provided by non-mainframe vendors. The largest proportion of the market, 16%, is attributed to SAP.
- Altogether, 42 different hardware suppliers and 33 software vendors were mentioned.

2. USERS' ATTITUDES CONCERNING MAINTENANCE AND COVERAGE

- Exhibit III-74 reveals that the Germans at this stage are no more willing than their fellow Europeans to relinquish their maintenance contracts in favour of time and materials bases of payment. This is only slightly less emphasised in the case of applications software. Nevertheless, 305 out of 321 respondents prefer the contract agreement.
- A much larger percentage of German users prefer time and materials arrangements for small business computers and minicomputers than do U.K. or French users.

EXHIBIT III-74

MAINTENANCE CONTRACT VERSUS TIME AND MATERIALS USAGE IN WEST GERMANY

CATEGORY	CONTRACT		TIME & MATERIALS	
	NUMBER	PERCENT	NUMBER	PERCENT
MAINFRAMES	77	99%	1	1%
SMALL BUSINESS COMPUTERS	31	84	6	16
MINICOMPUTERS	11	85	2	15
PERIPHERALS	50	98	1	2
TERMINALS	59	100	0	0
SYSTEMS SOFTWARE	54	98	1	2
APPLICATIONS SOFTWARE	23	82	5	18
TOTAL	305	95%	16	5%

- Concerning maintenance coverage, Exhibit III-75 shows that seven-day coverage is only required by 6% of users at the moment, and this will only increase by 1% in the foreseeable future.
- Up to 20% require six-day coverage, but a large majority, 68%, still need only five-day coverage, 7-10 hours per day. This will change little in the future.
- The coverage needed varies sometimes, according to different types of equipment:
 - 'DEC carries out preventive maintenance for CPUs and peripherals on Saturdays.'
 - 'For rented equipment we are covered round the clock.'
 - 'Availability can be less for terminals than for mainframes.'
- Outside contracted hours, only 9% of respondent users would do nothing but wait until the following day's maintenance contract shift becomes available.
 - Of the remainder, almost all pay for the engineer to call immediately, though some have had no experience to date. One respondent had not even been charged by IBM on the few occasions he had experienced a breakdown.

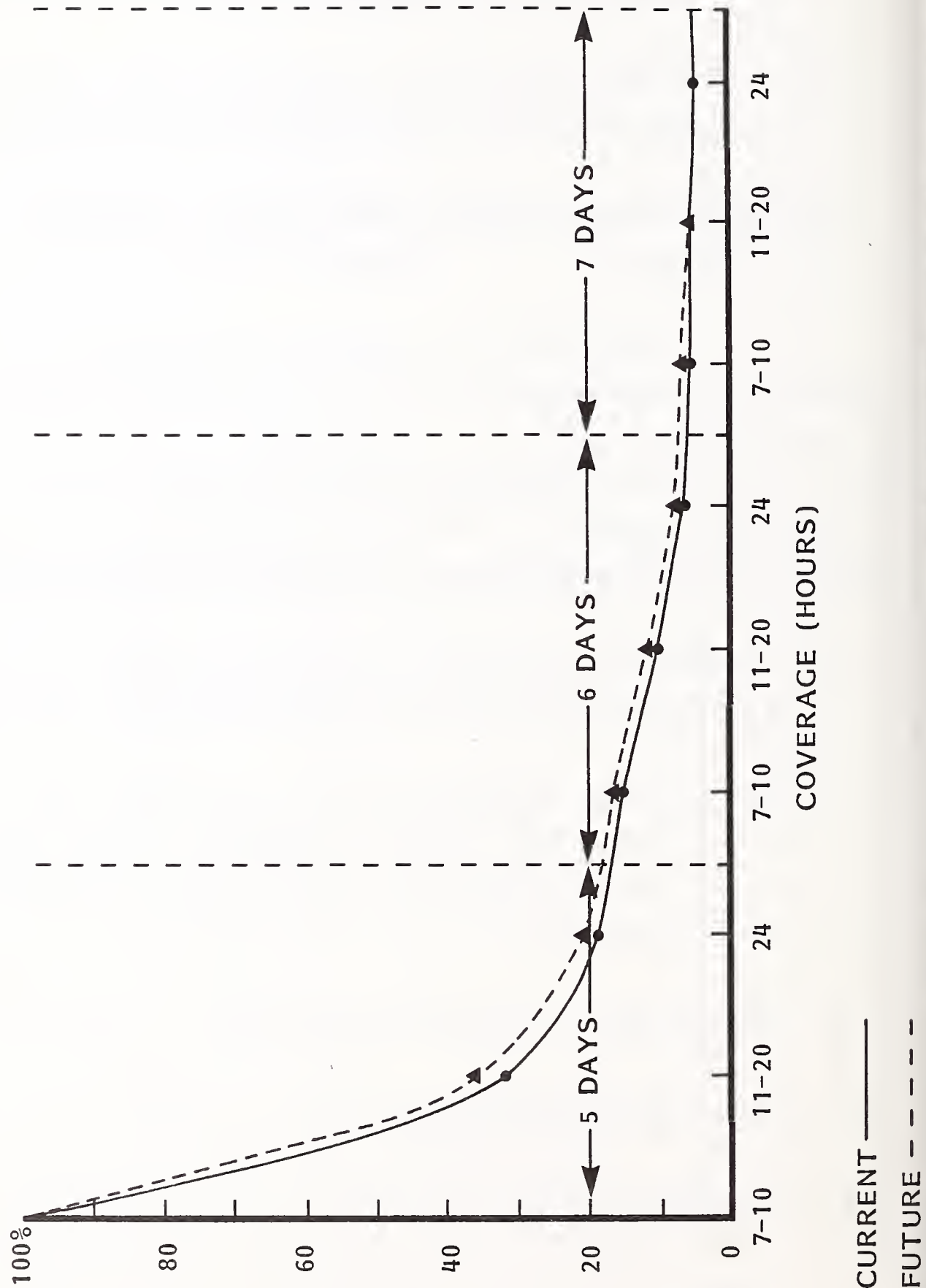
3. MEAN TIME TO RESPOND AND REPAIR

a. As Perceived By Users

- In Exhibits III-76 through III-80, cumulative graphs show the response and repair times which users would ideally like to have, and what they actually receive, along with the minimum level of service and the maximum length of time they would tolerate.

EXHIBIT III-75

CUMULATIVE MAINTENANCE COVERAGE REQUIREMENTS: CURRENT AND FUTURE IN WEST GERMANY



MAINFRAME MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR -
MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN
WEST GERMANY

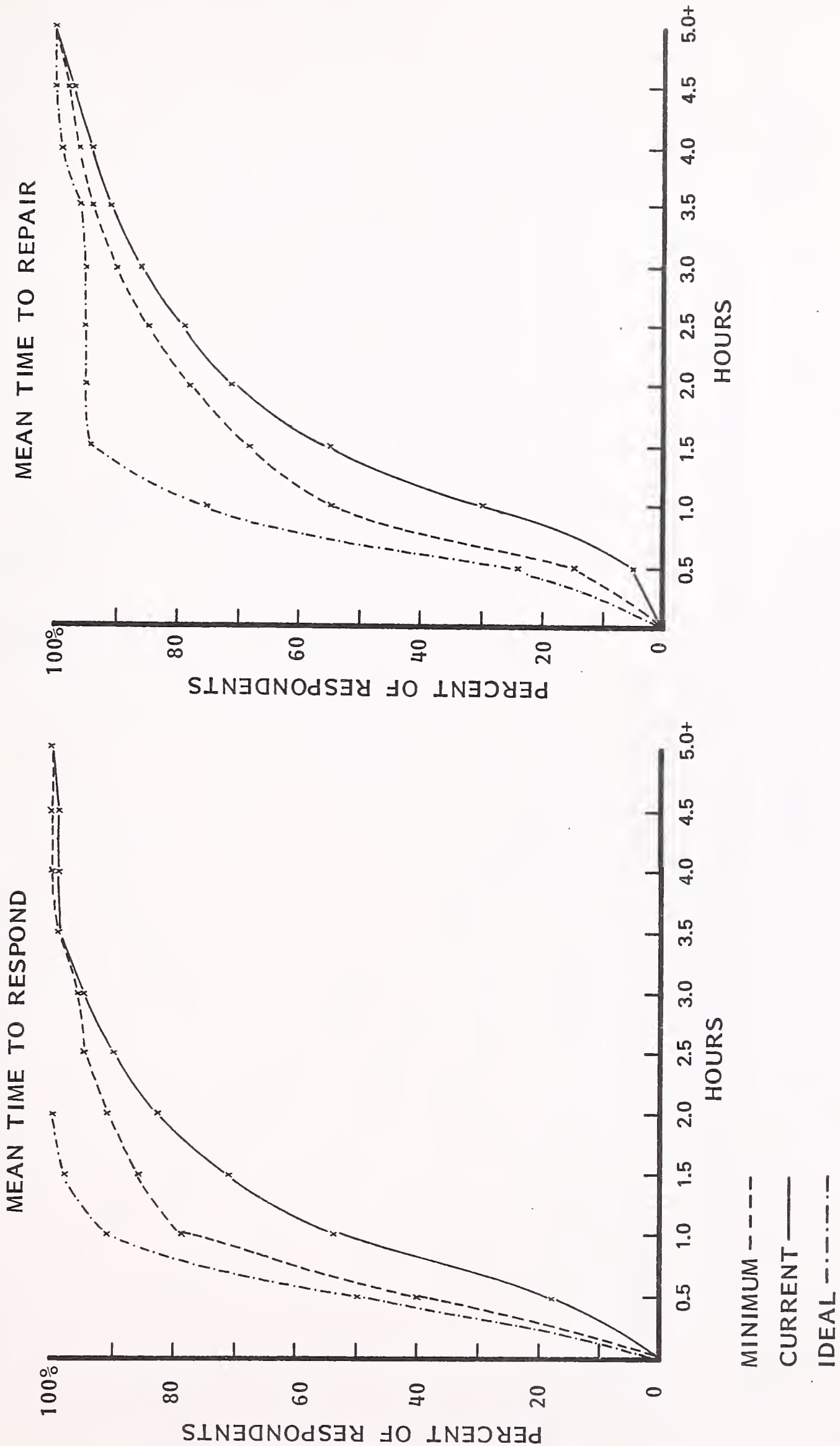
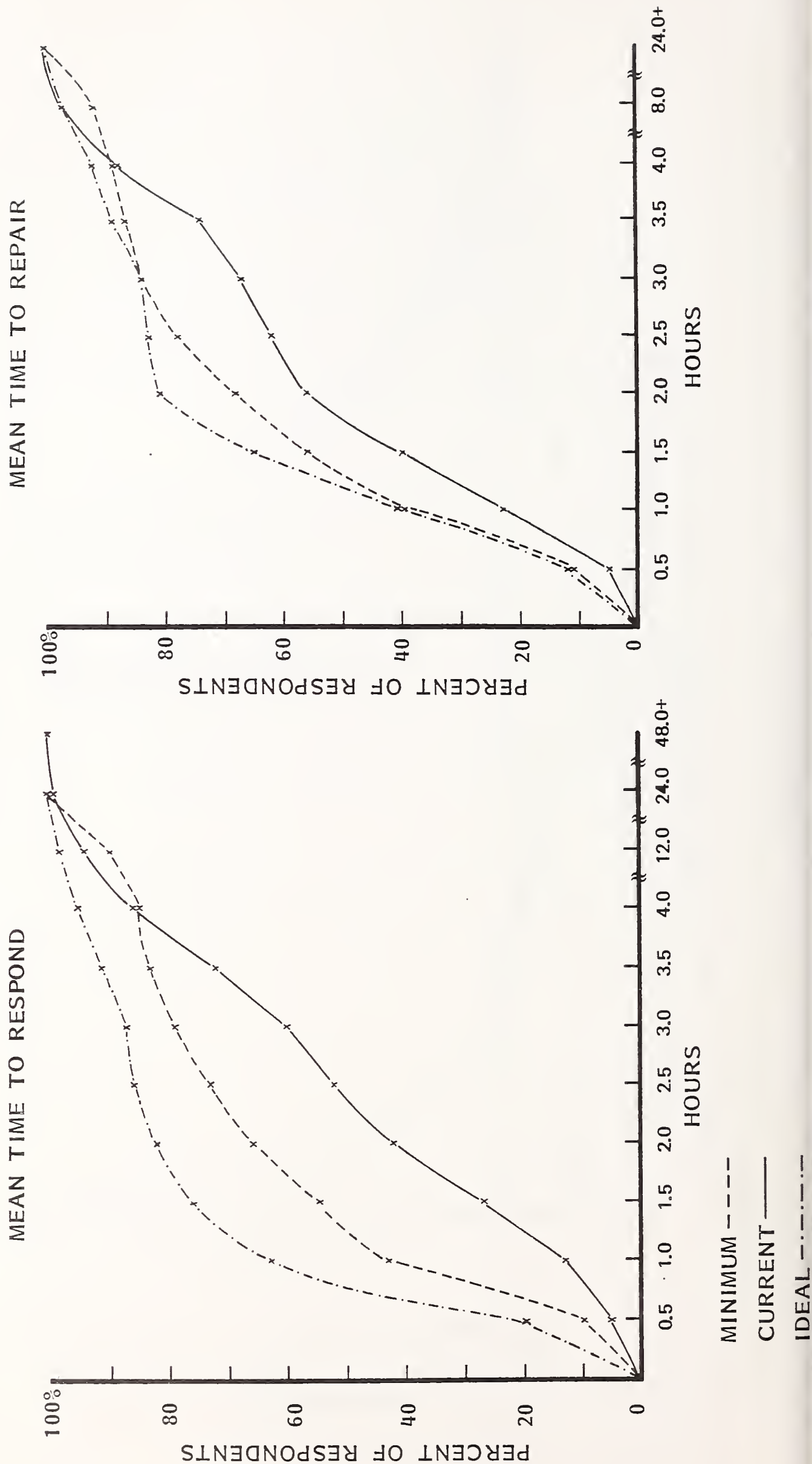


EXHIBIT III-77

SMALL BUSINESS MACHINE MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR - MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN WEST GERMANY



MINICOMPUTER MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR -
MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN
WEST GERMANY

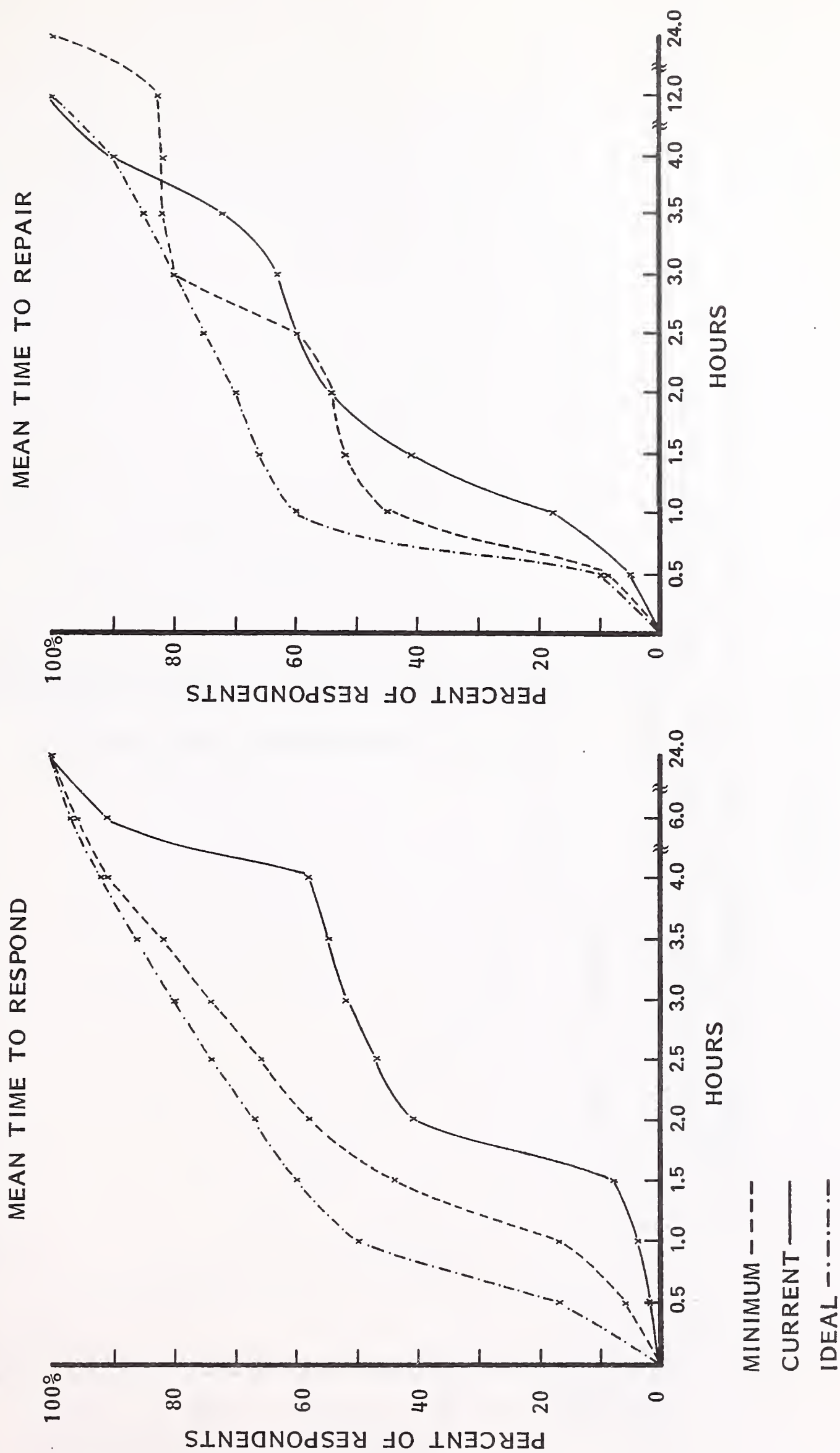
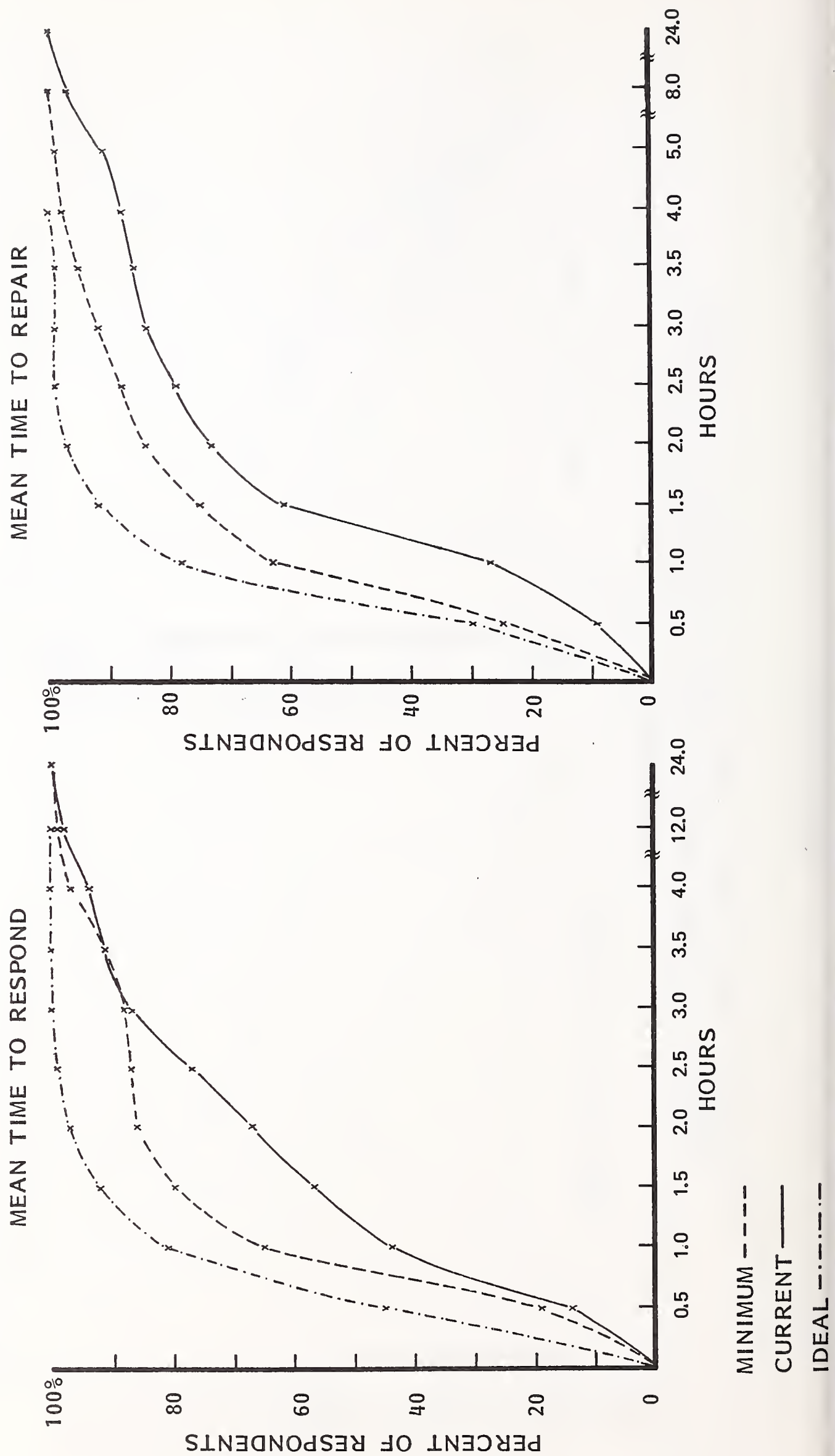
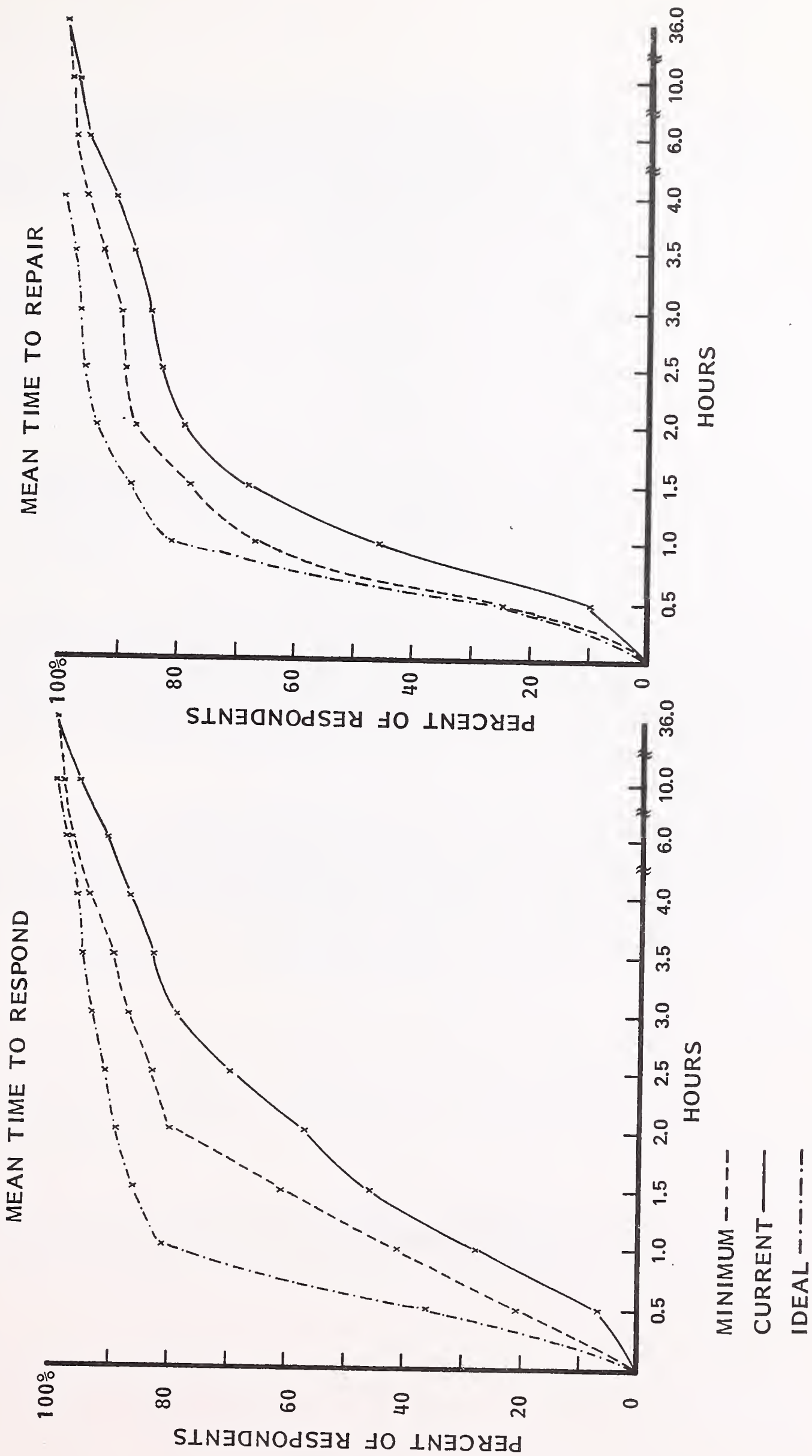


EXHIBIT III-79

PERIPHERAL MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR - MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN WEST GERMANY



TERMINAL MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR -
MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN
WEST GERMANY



- For all types of equipment, German users are experiencing response and repair times that do not meet their minimum acceptable level. However, the minimum-level curve never strays far from the 'ideal' curve, which implies that very little leeway is tolerated.
- The general standard received is marginally above that experienced in both the U.K. and France, but is similar for small business machines and mini-computers.
 - As this is the area where IBM has least influence, it is possible that IBM's high usage in Germany has raised the overall standard for the other equipment types.
- The great majority of users (94%) feel that field engineers should ideally respond to mainframe calls within two hours, and should effect repairs within the next hour and one-half. In actuality, 96% of calls are responded to within three hours, and 94% of users' repairs are completed within an additional four hours.
- Small business system users are harder to please. Eighty-two percent expect up to two-hour response times, although only 42% actually receive this. The repair should take only an additional two hours according to 87% of respondents, whereas the same percentage of users receives three and one-half hours.
- Minicomputers inspired the smallest response in the survey for Germany. Nevertheless, response was sufficient to indicate that engineers servicing this equipment fall way behind in the time it takes them to arrive on a site.
 - Up to four hours should be sufficient time; however, more than 40% indicated that this performance level was not met.

- Users hope for a very high standard for peripherals: 97% would like to see an engineer on the spot within two hours. The same percentage expect repairs to be effected within four hours, but it takes 24 hours and beyond for some.
- Response times, ideal and actual, vary considerably among respondent users of terminals.
- Although 81% would ideally like an engineer to arrive on the scene within an hour, this only happens for 28% of the respondents.
- Repair times, on the other hand, do not differ much between the ideal, minimum and actual. All of the respondents feel that repairs should ideally be carried out within four hours, and this does happen for 91%.
- Over one-third of the users are willing to pay an average 16% extra to see their ideal levels achieved, as Exhibit III-81 indicates. For an improvement in the standards for minicomputers and peripherals, up to 46% are prepared to pay extra - as much as an additional 18% in the case of minicomputer users.
- Even more users are willing to pay for an improvement in response and repair times for software maintenance. For systems software, users would pay an average premium of 27% to obtain an improvement.

b. Users' Satisfaction with Response and Repair Times

- Exhibit III-82 is an analysis of individual responses to ascertain:
 - How many respondents were satisfied with their actual response and repair times.
 - The number of dissatisfied users, that is, those for whom the standard received was below the minimum acceptable performance level.

EXHIBIT III-81

USERS' WILLINGNESS TO PAY MORE FOR IDEAL MAINTENANCE
IN WEST GERMANY

CATEGORY	WILLING		NOT WILLING		AMOUNT WILLING TO PAY	
	NUMBER	PERCENT	NUMBER	PERCENT	AVERAGE PERCENT	RANGE
MAINFRAMES	30	40%	45	60%	15%	1-50%
SMALL BUSINESS MACHINES	10	29	24	71	17	5-30
MINICOMPUTERS	5	45.5	6	54.5	18	10-25
PERIPHERALS	22	46	26	54	14	1-40
TERMINALS	21	36	37	64	14	2-50
TOTAL	88	39%	138	61%	16	1-50%

CATEGORY	WILLING		NOT WILLING		AMOUNT WILLING TO PAY	
	NUMBER	PERCENT	NUMBER	PERCENT	AVERAGE PERCENT	RANGE
SYSTEMS SOFTWARE	21	45%	26	55%	27	5-40%
APPLICATIONS SOFTWARE	12	48	13	52	15	5-50
TOTAL	33	46%	39	54%	21	5-50%

EXHIBIT III-82

USERS' SATISFACTION/DISSATISFACTION
WITH THEIR MAINTENANCE SERVICE
IN WEST GERMANY

RESPONSE TIMES

EQUIPMENT TYPE	SATISFIED*		NOT SATISFIED**	
	NUMBER	PERCENT	NUMBER	PERCENT
MAINFRAMES	23	27%	44	52%
SBCs	3	8	28	72
MINICOMPUTERS	1	8	7	58
PERIPHERALS	14	25	29	51
TERMINALS	11	15	31	43
SYSTEMS SOFTWARE	14	26	29	53
APPLICATIONS SOFTWARE	8	22	15	42

REPAIR TIMES

EQUIPMENT TYPE	SATISFIED*		NOT SATISFIED**	
	NUMBER	PERCENT	NUMBER	PERCENT
MAINFRAMES	22	28%	44	55%
SBCs	10	26	20	51
MINICOMPUTERS	5	46	4	36
PERIPHERALS	14	26	30	55
TERMINALS	31	51	40	66
SYSTEMS SOFTWARE	12	21	33	59
APPLICATIONS SOFTWARE	7	22	19	59

*SATISFIED = THOSE RESPONDENTS CURRENTLY ATTAINING - OR IMPROVING ON - THEIR IDEALS

**NOT SATISFIED = THOSE RESPONDENTS WHOSE CURRENT AVERAGE FALLS BELOW THEIR
MINIMUM LEVEL OF SERVICE.

- Seventy-two percent of the small business machine users are clearly not happy with their service. Ideals are achieved by 8% each of small business machine and minicomputer users.
- Terminal users appear to be more satisfied (51%) with times taken to repair their equipment than other users, but again, high percentages also appear in the column indicating dissatisfaction on the part of users.

4. USERS' SATISFACTION WITH MAINTENANCE

- Results on quality of the maintenance itself are shown in Exhibit III-83. Users' assessments are arranged into 'high', 'medium' and 'low' categories for all types of hardware and software.
 - Greatest satisfaction is experienced by mainframe users; 69% assessed the quality of maintenance to be high.
 - Although more respondents generally allocated high marks, the differences in opinion are less marked than for the two major European countries. This is especially true for small business systems and minicomputers, which parallel users' opinions of response and repair times. Again, it should be pointed out that IBM supplies only a small part of this equipment market, which could be an important reason behind these assessments.
- Exhibits III-84 and III-85 are alphabetical lists of hardware and software vendors named in this survey. The total number of mentions and average rating are given for each vendor.
 - High averages among mainframe vendors in the hardware sector are scored by CDC, IBM, NCR and, less exceptionally, by Siemens. Hewlett-Packard and Univac are around the average mark, with Honeywell and ICL both below average.

EXHIBIT III-83

USERS' SATISFACTION WITH MAINTENANCE IN WEST GERMANY

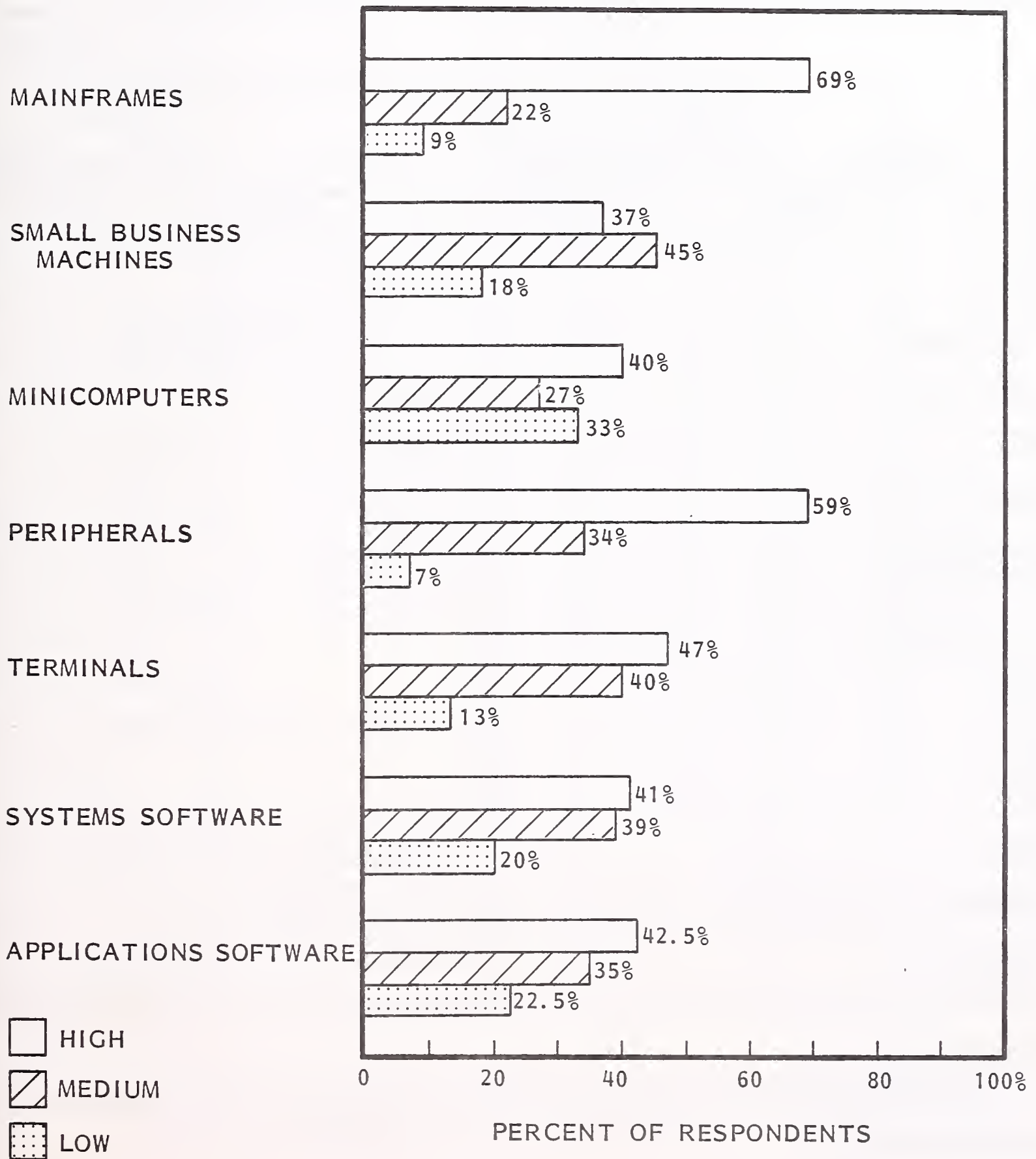


EXHIBIT III-84

USERS' RATINGS OF HARDWARE MAINTENANCE VENDORS
IN WEST GERMANY

VENDOR	RATING		VENDOR	RATING	
	TOTAL NUMBER OF MENTIONS	AVERAGE RATING		TOTAL NUMBER OF MENTIONS	AVERAGE RATING
BASF	12	4.08	NCR*	3	4.00
CDC*	7	3.71	NGR-DPI	3	4.00
DATASAAB*	5	2.00	NIXDORF	16	3.13
DATA 200	4	3.50	OLIVETTI	2	3.00
DEC	4	3.75	OLYMPIA	4	4.00
DOCUMATION	2	3.50	PHILIPS	5	3.00
HEWLETT- PACKARD*	4	3.25	RAYTHEON	2	3.00
HONEYWELL*	4	2.75	SACKINGER	2	4.00
IBM*	107	3.70	SEL	16	3.31
ICL*	5	2.20	SIEMENS*	31	3.52
ITT	9	3.11	STC	3	4.33
MDS	6	3.17	TEXAS INSTRUMENTS	3	2.67
MEMOREX	13	3.00	TRIUMPH-ADLER	3	4.00
MONROE	2	3.00	UNIVAC*	11	3.27

AVERAGE RATING = 3.36

N.B.: ONLY THOSE VENDORS MENTIONED AT LEAST TWICE HAVE BEEN LISTED; SINGLE MENTIONS HAVE BEEN OMITTED. HOWEVER, THEY AMOUNTED TO A TOTAL OF 14 VENDORS

*MAINFRAME VENDOR

EXHIBIT III-85

USERS' RATINGS OF SOFTWARE MAINTENANCE VENDORS IN WEST GERMANY

VENDOR	RATING	
	NUMBER OF MENTIONS	AVERAGE RATING
ADR/ROSCOE	4	3.25
ADV-ORGA	2	2.00
CA	8	3.25
CDC*	1	4.00
IBM*	51	3.17
NGR-DPI	2	4.00
SAP	6	3.00
SIEMENS	14	3.29
UCC	2	3.00
UNIVAC	5	2.80
WESTINGHOUSE	3	4.33

AVERAGE RATING = 3.28

N.B.: ONLY THOSE VENDORS MENTIONED AT LEAST TWICE HAVE BEEN LISTED;
SINGLE MENTIONS HAVE BEEN OMITTED. HOWEVER, THESE AMOUNTED
TO A TOTAL OF 22 VENDORS. THE EXCEPTIONS ARE MAINFRAME VENDORS.

*MAINFRAME VENDOR

- IBM falls below the average of 3.28 points in the list of software vendors, where highest averages are given to CDC, NGR-DPI and Westinghouse.
- No mainframe vendors among German respondents have been replaced as a result of poor maintenance, as seen in Exhibit III-86. The largest percentage is for peripheral equipment, 78%. The remainder is divided equally among small business machines/minis and terminals.
- Of the nine respondents claiming to have replaced hardware due to poor maintenance, three claimed to have replaced BASF peripheral equipment.
- IBM is absent from this list, as seen in Exhibit III-87, but was replaced as a software vendor, as shown in Exhibit III-88, by two respondents. This cannot be considered unreasonable, however, bearing in mind the high number of mentions they receive compared with other vendors.

5. USERS' SATISFACTION WITH PERSONNEL AND PROCEDURES

- German users are convinced there has been little or no change in the quality of the engineers or their management. Exhibit III-89 shows that 70% believe the quality of engineers has stayed the same, while 78% believe the quality of management is the same.
- In the more stable economy of West Germany, engineers enjoy satisfactory incentive schemes and are more generally content in their employment than, in particular, the U.K. As a result of this constancy in personnel, engineers are turned out well-trained and adequately prepared when new systems are introduced on the market.
- Comments from users reflect this:
 - 'No change in personnel in the last three years.'

EXHIBIT III-86

NUMBER OF VENDORS REPLACED DUE TO POOR MAINTENANCE IN WEST GERMANY

TYPE OF HARDWARE	WEST GERMANY	TOTAL WEST EUROPE
MAINFRAME	0%	4%
SBC/MINI	11	24
PERIPHERAL	78	52
TERMINAL	11	20

TOTAL NUMBER OF RESPONDENTS IN WEST GERMANY = 9

EXHIBIT III-87

HARDWARE VENDORS REPLACED
DUE TO POOR MAINTENANCE
IN WEST GERMANY

VENDOR	EQUIPMENT REPLACED
BASF	PERIPHERAL EQUIPMENT
BASF	PERIPHERAL EQUIPMENT
BASF	PERIPHERAL EQUIPMENT
BURROUGHS	MINICOMPUTER
CDC	PERIPHERAL EQUIPMENT
ICL	PERIPHERAL EQUIPMENT
MDS	TERMINAL
MDS	PERIPHERAL EQUIPMENT
POTTER	PERIPHERAL EQUIPMENT

EXHIBIT III-88

SOFTWARE VENDORS REPLACED
DUE TO POOR MAINTENANCE
IN WEST GERMANY

VENDOR	NUMBER OF RESPONDENTS
DIALOGICA	1
IBM	2
MDS	1
STARK (STUTTGART)	1

THE ABOVE VENDORS WERE ALSO THE MAINTENANCE VENDORS

EXHIBIT III-89

CHANGES IN THE QUALITY OF FIELD
ENGINEERS AND FIRST-LINE MANAGERS IN
WEST GERMANY

CHANGE	FIELD ENGINEERS	FIRST-LINE MANAGERS
SAME	70%	78%
BETTER	9	9
POORER	21	13

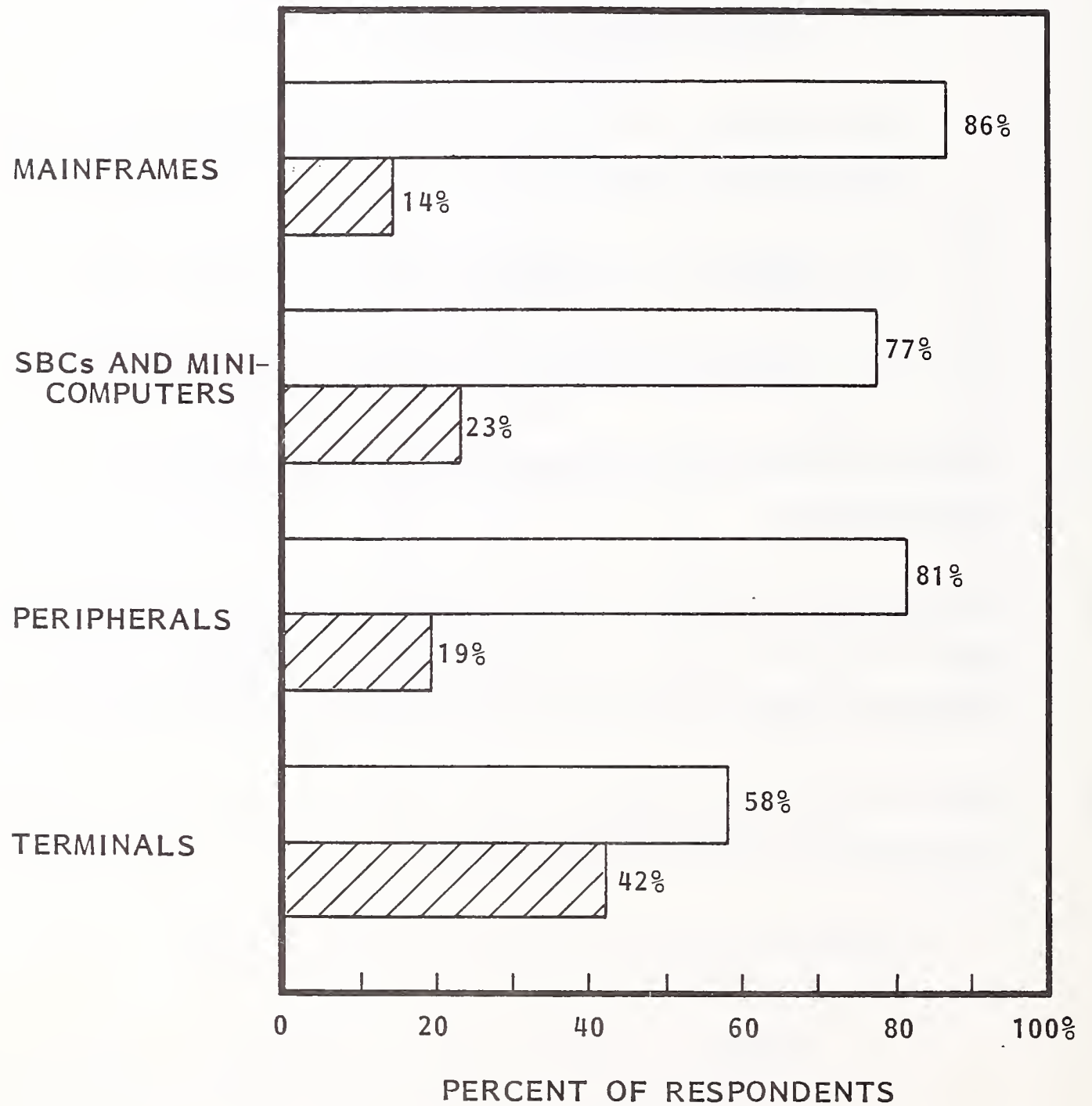
- 'Maintenance is always carried out by the same engineers.'
 - 'We have continuously had the same people.'
- The same is true for management:
 - 'No changes have been made.'
 - 'Management has not changed.'
- Only 9% believe the quality in engineering staff and their managers has deteriorated in the last year:
 - 'Engineers are no longer prepared to work overtime.'
 - 'Software maintenance has become much worse.'

6. USERS' ATTITUDES AND CONCERNS ABOUT UNBUNDLING MAINTENANCE

- A fixed pricing structure is without doubt far more popular than an incremental structure based on service received. Again, only for terminal equipment is there any substantial interest in using an incremental structure.
- Exhibit III-90 shows opinions as they apply to mainframes, small business systems/minis, peripherals and terminals.
- Quotations supporting fixed price contracts include:
 - 'Whatever we decide depends on statistics we produce. We use the fixed price system for equipment which is not duplicated and on which we heavily depend.'

EXHIBIT III-90

UNBUNDLING OF MAINTENANCE BY EQUIPMENT TYPE IN
WEST GERMANY



- ☐ FIXED PRICING STRUCTURE
- ☒ INCREMENTAL PRICING STRUCTURE

- . 'The fixed pricing structure is unambiguous and provides clear cost consideration with monthly maintenance fees.'
- . 'We prefer fixed pricing because we have no control over how often the machine will break down.'
- . 'Fixed pricing is more desirable, so that we have no unforeseen expenses.'
- An incremental pricing structure is favoured by users of more up-to-date and more reliable equipment.
- Users are not particularly eager to perform maintenance themselves, as is apparent in Exhibit III-91. For those who do, however, cost savings can be considerable and can reach 43% as for software maintenance.
- Diagnostics is the area where respondents are most likely to perform any tasks usually carried out by a maintenance engineer.
- Respondents were asked how they felt about paying for on-site spares. Only 16 respondents out of 87 are prepared to do this.
- For the remainder, the idea, especially of paying for the facility, was horrific:
 - 'The manufacturer is only as good as the service he provides. If a client has to pay to store spare parts on his own site, there is something wrong with the manufacturer.'
 - 'It should be included in the basic maintenance price.'
 - 'We already stock spares without being charged.'
 - 'Why should I pay even more when I've got the space available anyway?'

EXHIBIT III-91

USERS' WILLINGNESS TO PERFORM MAINTENANCE ACTIVITIES IN
WEST GERMANY

TYPE OF USER	INSTALL EQUIPMENT	PERFORM DIAGNOSTICS	HARDWARE MAINTENANCE	SOFTWARE MAINTENANCE	DEPOT MAINTENANCE
NOT CURRENTLY PERFORMING	98%	68%	95%	82%	94%
CURRENTLY PERFORMING	2	32	5	18	6
PERCENT SAVINGS	10*	23	20*	43	38
NOT PERFORMING - WOULD NOT CONSIDER	100	96	100	84	95
NOT PERFORMING WOULD CONSIDER	0	4	0	16	5
ANTICIPATED PERCENT SAVINGS	N/A	ND	N/A	32	ND

ND = NO DATA N/A = NOT APPLICABLE * ONLY ONE RESPONDENT

7. USERS' ATTITUDES TOWARDS THIRD-PARTY MAINTENANCE

- Exhibit III-92 lists both users' reasons for considering third-party maintenance, and reasons for not.
- Reasons in favour of the idea fall neatly into three categories: cost savings, speed and availability, both of engineers and parts, and an all-round better service. However, only 28% of all respondents would be prepared to consider it at all.
- Respondents not keen on the idea fall into a familiar pattern:
 - Satisfaction with their present system.
 - Believing the manufacturer to have trained engineers on the latest models.
 - Total familiarity with their own products.
 - Ease of obtaining spare parts.
 - Security of a large organisation.
- The concept of third-party maintenance is relatively new to Germany. Up to two years ago it was difficult to even locate a third-party organisation in that country.
- One response which was not included in Exhibit III-92:
 - 'If IBM and Memorex can't get enough qualified personnel, what chance have other firms?'

EXHIBIT III-92

THIRD-PARTY MAINTENANCE IN WEST GERMANY:
NON-USERS' PERCEPTIONS AND REASONS FOR CONSIDERING/NOT CONSIDERING

FACTOR (FOR CONSIDERING THIRD PARTY)	PERCENT
COST SAVINGS	72%
AVAILABILITY/SPEED	16
BETTER SERVICE/RELIABILITY	12

FACTOR (FOR NOT CONSIDERING THIRD PARTY)	PERCENT
HAPPY WITH MANUFACTURER/HIS SERVICE IS BETTER	20%
MANUFACTURER BEST KNOWS HIS OWN PRODUCTS	13
MANUFACTURERS' RESPONSIBILITY TO MAINTAIN HIS OWN PRODUCTS	7
SPARE PARTS BETTER AVAILABLE WITH MANUFACTURER	11
INSECURITY OF THIRD PARTIES	20
CONFLICT OF INTERESTS	16
PREVIOUS BAD EXPERIENCE WITH THIRD PARTIES	4.5
NOT ALLOWED BY MANUFACTURER	4.5
DON'T KNOW ANY THIRD-PARTY ORGANISATIONS	2
DON'T BELIEVE WE WOULD FIND A SUITABLE FIRM	2

8. USERS' SENSITIVITY TO MAINTENANCE PRICING

- A positive attitude is evidenced by German respondents when considering how to counter rising maintenance costs. Relatively few felt there was nothing they could do, and even then it was because an increase of 8-10% was not considered unreasonable and had been allowed for.
- The most common solutions were:
 - To use mixed-vendor hardware.
 - To exchange current equipment for more up-to-date models requiring less maintenance.
 - To use outside software in order to reduce staff.
 - To do their own maintenance.
- Some felt either that there was no problem, or that the costs were justified and to be expected:
 - 'In our experience, hardware technology justifies personnel costs.'
 - 'There have been no hardware increases for a long time.'
 - 'A lump sum maintenance contract is best.'
- Rising costs become a problem:
 - 'When maintenance costs exceed 1.2% of turnover.'
 - 'With a data collection system that was installed in 1971.'
 - 'When EDP costs cease to bear a reasonable relation to turnover.'

- 'Since software has cost money; under old contracts it was put in free of charge.'
- Users' perceptions of how maintenance costs have changed in the last year compared with previous years is shown in the table below:

	<u>Change in Cost</u>	<u>Average</u>	<u>Change Relative to Value of Eqpt.</u>	<u>Average</u>
Increased:	45%	13%	64%	3%
Same:	47	-	29	-
Decreased:	<u>8</u>	13	<u>7</u>	10
	100%		100%	

9. USERS' ATTITUDES TOWARDS ELIMINATING PREVENTIVE MAINTENANCE

- Of the three major countries included in this survey, German respondents are the least reluctant to eliminate preventive maintenance for a cost savings.
 - PM would not be eliminated at any price by 39% of respondents. Thirty percent would have to save in excess of 20% on their maintenance contract to do so.
- Preventive maintenance is with German users, as with their British and French counterparts, third in importance behind mean times to respond and to repair. Exhibit III-93 shows that it is nevertheless highly rated by 56% of respondent users.

EXHIBIT III-93

IMPORTANCE OF FIELD MAINTENANCE
CHARACTERISTICS - USERS' RATINGS IN
WEST GERMANY

FACTOR	PERCENT HIGH RATINGS	AVERAGE RATING*
MEAN TIME TO RESPOND	90%	4.4
MEAN TIME TO REPAIR	90	4.4
PREVENTIVE MAINTENANCE	56	3.3

10. USERS' ATTITUDES TOWARDS REMOTE DIAGNOSTICS

- Generally, users of remote diagnostics found the quality of service had improved or stayed the same:

-	Better	25%
-	Same	61
-	Poorer	<u>14</u>
		100%

- The service had been in use for an average of 10.1 months, discounting completely new users to the system.

- The table below shows the distribution of equipment on which respondents found remote diagnostics to be available.

-	Mainframes	63%
-	SBC/Minis	2
-	Peripherals	9
-	Terminals	6
-	Software	<u>20</u>
		100%

- Vendors mentioned as offering this facility to clients include:

- IBM.

- Nixdorf.
 - Honeywell.
 - NCR.
 - Siemens.
 - CA.
 - DEC.
 - SEL.
 - ADR.
 - CEDA.
- Non-users were asked for their reactions if offered the service. Overwhelmingly, 76% stated that it would be an improvement. A further 17% thought it would make little difference, and only 7% were against the idea.
- Cost appears, as usual, to be an important factor:
 - 'Positive reaction, as long as a cost reduction is involved.'
 - 'Would accept, if at the same cost.'
 - There were other reservations:
 - 'Positive - if it can be shown that diagnosis will be speeded up.'
 - 'It's only worth it if the resulting repairs can also be carried out by ourselves.'

- Unconditional responses fell into positive and negative categories:
 - . 'I would activate it immediately.'
 - . 'I would refuse.'

II. USERS' PERCEPTIONS OF ESCALATION PROCEDURES

- As in France, only a low percentage of respondents are currently provided with formal escalation procedures by their maintenance suppliers: 14 out of a total of 73 respondents.
- All but one of those who expressed an opinion considered their service had definitely improved as a result, as Exhibit III-94 indicates.
- Respondents without this service were rather sceptical as only 12% believed it would be of use to them.
- Comments from users of the system were very emphatic:
 - 'With the expansion of our system, a formal escalation procedure is undoubtedly necessary.'
 - 'A most definite improvement in combatting long, total breakdowns.'
 - 'Quick reaction is received in an emergency.'
 - 'In our experience, necessary in every case.'
 - 'A speedy diagnosis of uncommon faults. The central office is informed within two hours and within three hours more engineers are sent.'
- The single objector is clearly a victim of the other end of the scale:

EXHIBIT III-94

USERS' SATISFACTION LEVELS WITH ESCALATION PROCEDURES IN WEST GERMANY

COMMENT	RESPONDENTS WITH A FORMAL ESCALATION PROCEDURE		RESPONDENTS WITH- OUT A FORMAL ESCALATION PROCEDURE	
	NUMBER	PERCENT	NUMBER	PERCENT
IMPROVED	9	64 %	7	12 %
SAME	0	0	38	64
POORER	1	7	0	0
NON-COMMITTAL/ DON'T KNOW, ETC.	4	29	14	24
TOTAL	14	100 %	59	100 %

MAINFRAME VENDORS	PERCENT	NON-MAINFRAME VENDORS	PERCENT
IBM	50%	DEC	7%
UNIVAC	7	DOCUMATION	7
		STC	7

N.B.: NOT ALL RESPONDENTS NAMED THE RELEVANT SUPPLIER

- 'There is now a reduction in normal availability.'
 - Only 24% would prefer to purchase products from a vendor providing a formal escalation procedure as part of their maintenance programme.
12. EFFECTIVENESS OF NEW MAINTENANCE TECHNIQUES INTRODUCED BY VENDORS
- New techniques considered by users to have been most effective are:
 - IBM Retain-System - this resulted in a reduction in maintenance time.
 - IBM Central Maintenance Service - a higher quality of engineers now available.
 - Remote diagnostics - better diagnosis and therefore a faster repair.

13. USERS' COMMENTS ON MAINTENANCE IMPROVEMENT

- Users indicated they would like to see the following improvements made in maintenance:
 - 'Better trained and more qualified engineers.'
 - 'Better response and repair time.'
 - 'Improved preventive maintenance.'
 - 'Remote diagnostics.'
 - 'Better availability of spare parts.'
 - 'Answering service and standby team outside normal hours.'

- 'Client training.'
- 'Better interaction in fault diagnosis between hardware and software.'
- 'No disturbances on interactive work.'
- 'Diagnosis to be made by two engineers.'
- 'Specialists for software systems.'
- 'Precise communication of fault to technician.'
- 'Lower hourly rate.'
- 'Trend observation.'

F. USER RESPONSES: BELGIUM AND THE NETHERLANDS

- I. VENDOR PROFILES AND GENERAL USER SATISFACTION WITH MAINTENANCE
 - Considering the small sample size, full exhibits analysing market proportions held by hardware and software vendors would not have given accurate results for Belgium and the Netherlands.
 - Even with a small sample, IBM emerges as the clear leader in each category. Despite being mentioned six times in the hardware sector, IBM's average rating is 3.8 on a scale of 1-5, which is higher than the average rating, although topped by DataSaab (4.5) and Honeywell (4.0).

- Exhibit III-95 does, however, list alphabetically the vendors used by respondents for both hardware and software, and the number of respondents who claimed to be using their maintenance services.
- The ratings allocated by respondent users, on the same 1-5 scale, are accumulated for hardware and software and are shown in Exhibit III-96.
 - Of hardware users, 74% are more than adequately satisfied with their maintenance service, whereas 16% are less than happy.
 - A similar percentage of software users, 17%, claimed dissatisfaction, although only 33% rated their maintenance as being of high quality.
- Nearly half the respondents in the survey had replaced equipment in the past two years due to poor maintenance, the majority of which was mainframe equipment.

2. MEAN TIME TO RESPOND AND REPAIR AS PERCEIVED BY USERS

- Exhibit III-97 shows the ideal, current and minimum acceptable levels for response and repair times, as viewed by users.
- Like all countries except the U.K., the current performance curves fall below those representing the minimum acceptable level.
- All respondents expect the engineer to arrive within 24 hours, whereas it can in fact take twice as long.
- A very high standard is expected concerning the time it takes for the repair to be effected. All respondents would like this to take no longer than an hour and one-half, although it currently takes up to four hours.

EXHIBIT III-95

USERS' RATINGS OF HARDWARE AND SOFTWARE VENDORS IN
BELGIUM AND THE NETHERLANDS

(A) HARDWARE VENDORS

VENDOR	RATING	
	TOTAL NUMBER OF MENTIONS	AVERAGE RATING
AMDAHL*	1	5.0
BURROUGHS*	1	2.0
DATAPoint	1	5.0
DATASAB*	2	4.5
DEC	1	4.0
HEATHRIT	1	5.0
HONEYWELL*	2	4.0
IBM*	6	3.8
NCR*	1	1.0
PERICOM	1	3.0
REGNECENTRALEN	1	4.0
UNIVAC*	1	2.0

(B) SOFTWARE VENDORS

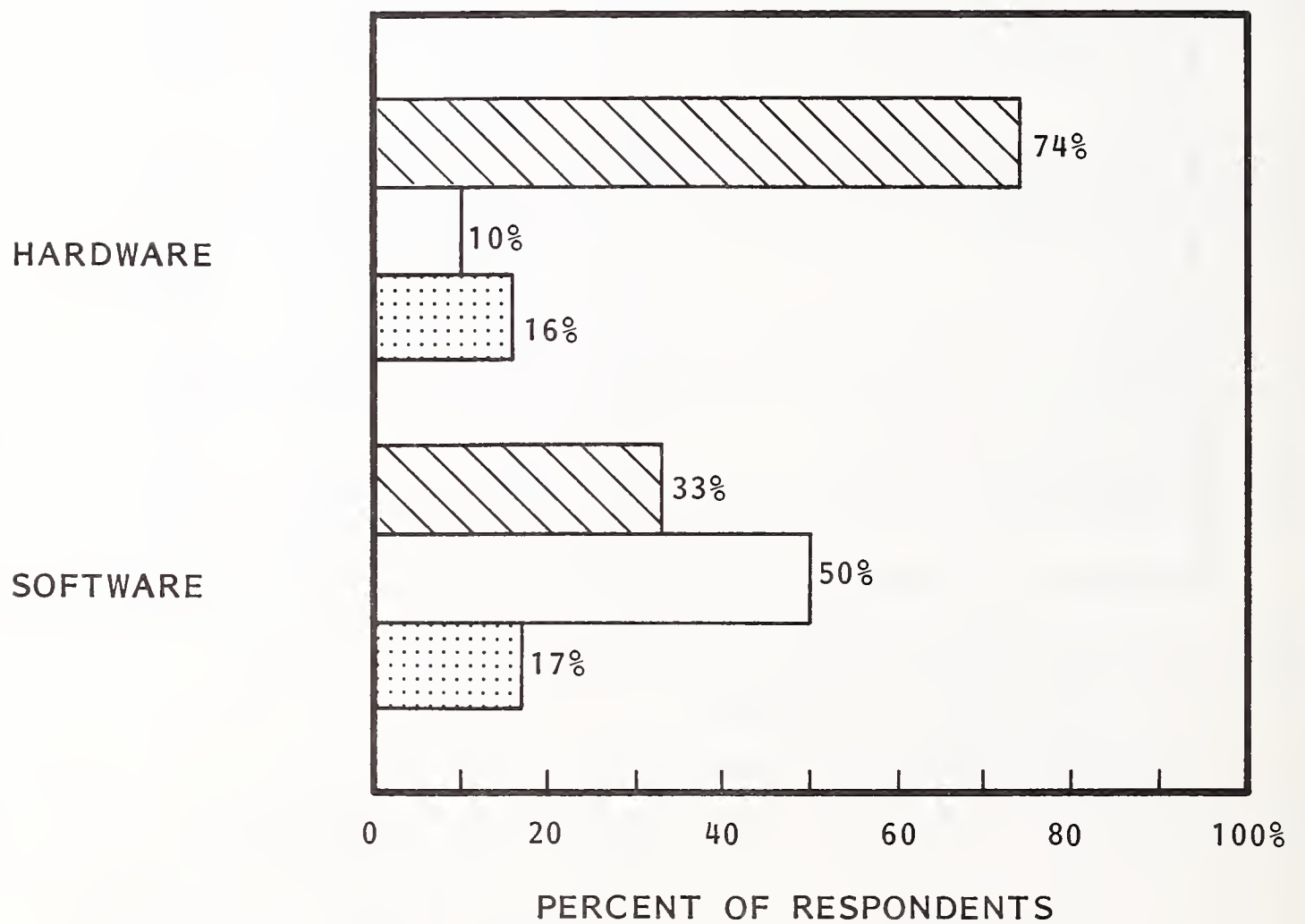
VENDOR	RATING	
	TOTAL NUMBER OF MENTIONS	AVERAGE RATING
CULLINANE	1	3.0
IBM*	3	3.0
MVS	1	4.0
SAIV	1	3.0

AVERAGE RATING = 3.3

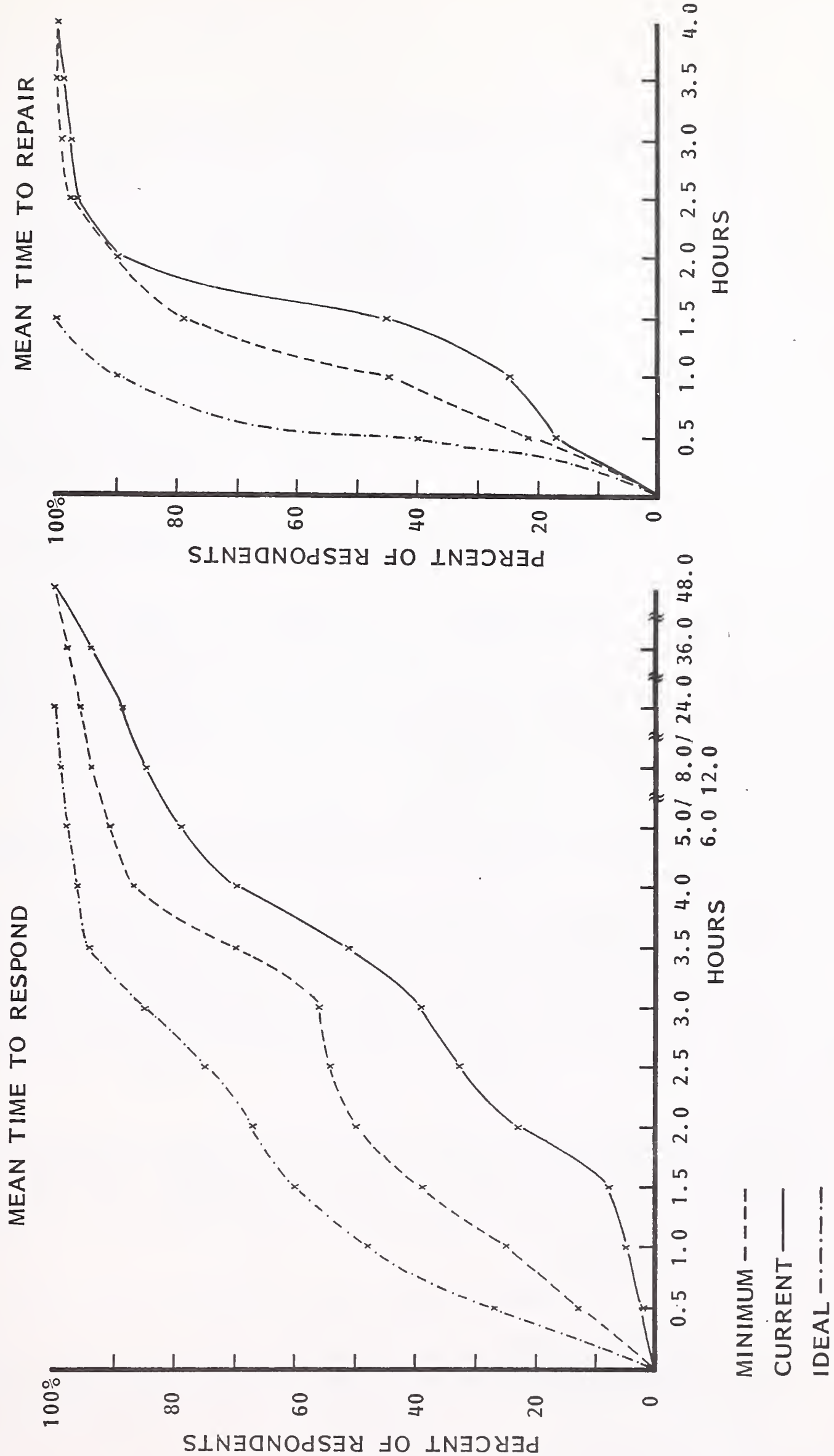
*MAINFRAME VENDORS

EXHIBIT III-96

USERS' SATISFACTION WITH MAINTENANCE IN
BELGIUM AND THE NETHERLANDS



HARDWARE EQUIPMENT MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR -
MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN
BELGIUM AND THE NETHERLANDS



- The table below shows:
 - The number of users achieving, or in some cases even improving on, their ideal response and repair times.
 - The number receiving response and repair times below what they consider to be their minimum acceptable level.

	<u>REPAIR TIME</u>	<u>RESPONSE TIME</u>
Satisfied	46%	30%
Dissatisfied	31%	27%

- When asked whether they would pay more for an improved response/repair rate, 20% of respondents said they were willing to pay an average of 12.5% more.

3. USERS' ATTITUDES TOWARDS THIRD-PARTY MAINTENANCE

- No Belgian or Dutch respondents claimed to be using a third-party maintenance organisation. The reasons were summed up by the respondent who said: 'Maintenance must be carried out by the manufacturer's field service organisation because they have better-specialised employees and equipment to do the job.'
- Only a single respondent was ready to consider the possibility of using a third-party for maintenance, and even then only if he was satisfied that the organisation had a good reputation and a good record of success in the eyes of other users.
- The major reasons that respondents would not consider using a maintenance service other than that provided by the equipment supplier include:

- 'We have not had good results with third-party maintenance companies in the past.'
- 'Communication and responsibility problems between vendor and maintenance company would cost me too much.'
- However, others simply had not been approached, did not believe such a service was available in their locality, or had rental agreements which included maintenance and therefore eliminated the possibility of using an outside service.

4. USERS' SENSITIVITY TOWARDS MAINTENANCE PRICING

- The table below shows users' perceptions as to how maintenance costs have changed in the last twelve months over previous years.

	<u>Change in Cost</u>	<u>Average</u>	<u>Change Relative to Value of Eqpt.</u>	<u>Average</u>
Increased:	20%	10%	50%	1%
Same:	80	-	-	-
Decreased:	<u>-</u>	N / A	<u>50</u>	N/A
	100%		100%	

- Respondents had no great plans for dealing with rising maintenance prices, apart from holding additional machines in reserve and buying software packages.

5. USERS' ATTITUDES TOWARDS REMOTE DIAGNOSTICS

- Three-quarters of the respondent users are being supplied by their vendors with remote diagnostics. These vendors include:

- Amdahl.
 - Datapoint.
 - DEC.
 - Honeywell.
 - IBM.
- Although most users felt it had improved their service, several felt it was so new that they could not yet give an opinion.
 - None of the users of a remote diagnostic facility is experiencing any cost savings as a result.
 - Only one non-user would be averse to the facility, if it were offered him.

6. USERS' PERCEPTIONS OF ESCALATION PROCEDURES

- Only one respondent's supplier has provided a formal escalation service at present, and 50% of non-users feel it would not improve their maintenance service.
- However, when asked in a separate question whether they would prefer to buy products from a vendor providing a formal escalation procedure as a part of their maintenance activities, 57% of respondents replied that they would.

7. USERS' COMMENTS ON MAINTENANCE IMPROVEMENT

- Users indicated they would like to see the following improvements made in maintenance:

- 'Technicians specialised in problem areas instead of a "common" engineer. Problem is getting the right man in time.'
- 'More trained personnel.'
- 'Regularly scheduled preventive maintenance.'
- 'Remote diagnostics.'
- 'Spare parts stored locally.'
- 'Number of maintenance engineers divided by the number of problems.'

G. USER RESPONSES: NORWAY AND SWEDEN

I. VENDOR PROFILES AND GENERAL USER SATISFACTION WITH MAINTENANCE

- The survey population for Norway and Sweden, although larger than for Belgium and the Netherlands, does not merit full analysis by equipment type. Again, however, a broader analysis is possible, and Exhibit III-98 shows the number of mentions, together with average ratings given by users (on the 1-5 scale) for hardware and software.
- It should be pointed out here that DataSaab and Univac operate separately in Sweden, and Saab-Univac jointly in Norway. For the purpose of these analyses the companies are separated into three organisations:
 - DataSaab.
 - Saab-Univac.
 - Univac.

EXHIBIT III-98

USERS' RATINGS OF HARDWARE AND SOFTWARE VENDORS IN
NORWAY AND SWEDEN

(A) HARDWARE VENDORS

VENDOR	RATINGS		VENDOR	RATINGS	
	TOTAL NUMBER OF MENTIONS	AVERAGE RATING		TOTAL NUMBER OF MENTIONS	AVERAGE RATING
BASF	1	5.0	MEMOREX	3	3.7
DATA GENERAL	1	4.0	NORDISK- ELEKTRIC	1	2.0
DATASAAB*	7	3.4	SAAB-UNIVAC*	9	3.8
DEC	1	3.0	SIEMENS*	3	4.0
ESSELTE	2	4.8	TELUB	1	3.0
HEWLETT- PACKARD	2	4.0	UNIVAC*	1	2.0
IBM*	20	4.3	WANG	1	3.0
ICL*	9	3.3			

(B) SOFTWARE VENDORS

VENDOR	RATINGS		VENDOR	RATINGS	
	TOTAL NUMBER OF MENTIONS	AVERAGE RATING		TOTAL NUMBER OF MENTIONS	AVERAGE RATING
ABATLAND	1	4.0	HEWLETT- PACKARD*	1	3.0
ADR	1	3.0	IBM*	13	3.6
BUSINESS SYSTEMS	1	4.5	ICL*	4	2.5
DATALOGIC	1	4.0	SAAB-UNIVAC*	4	1.8
DATEMA	1	4.0	TECH-SPENDER	1	4.5
DEC	1	3.0			

AVERAGE RATING = 3.4

*MAINFRAME VENDORS

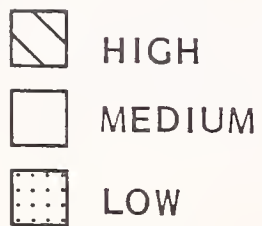
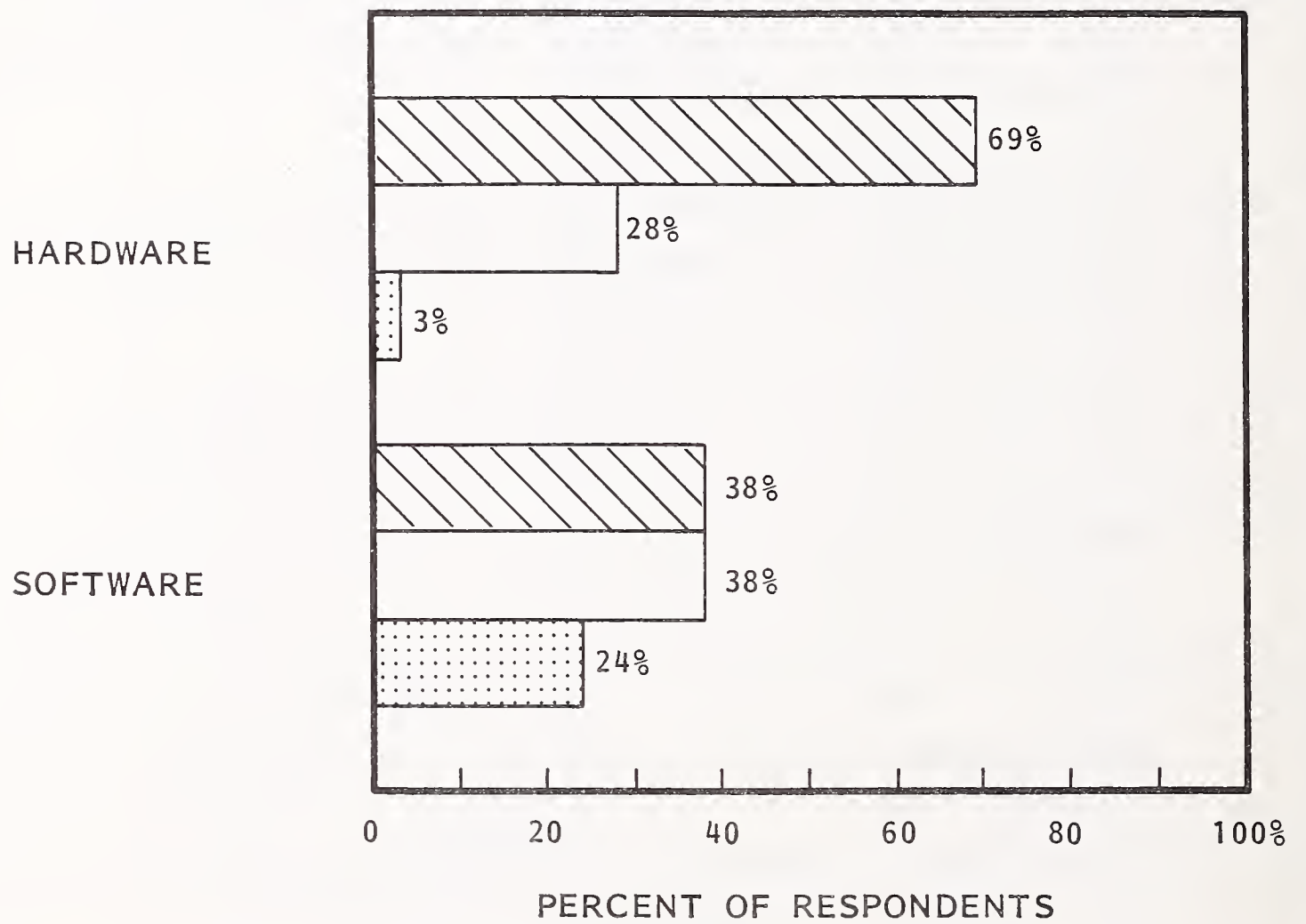
- IBM is mentioned over twice as often as its nearest competition in both the hardware and software lists, scoring a very high average for hardware (4.3 points) and above average for software maintenance.
- The Swedish company Esselte provides the best hardware maintenance service and is accredited 4.8 points out of 5.
- Exhibit III-99 shows users' general satisfaction with the quality of maintenance they are receiving.
- Very few respondents (3%) gave a low satisfaction rate for hardware maintenance, but nearly a quarter (24%) felt they were receiving a low standard of software maintenance.
- Only 8% of respondents have replaced hardware equipment in the past two years as a result of poor maintenance, and none have replaced software for that reason, over the same period.

2. MEAN TIME TO RESPOND AND REPAIR AS PERCEIVED BY USERS

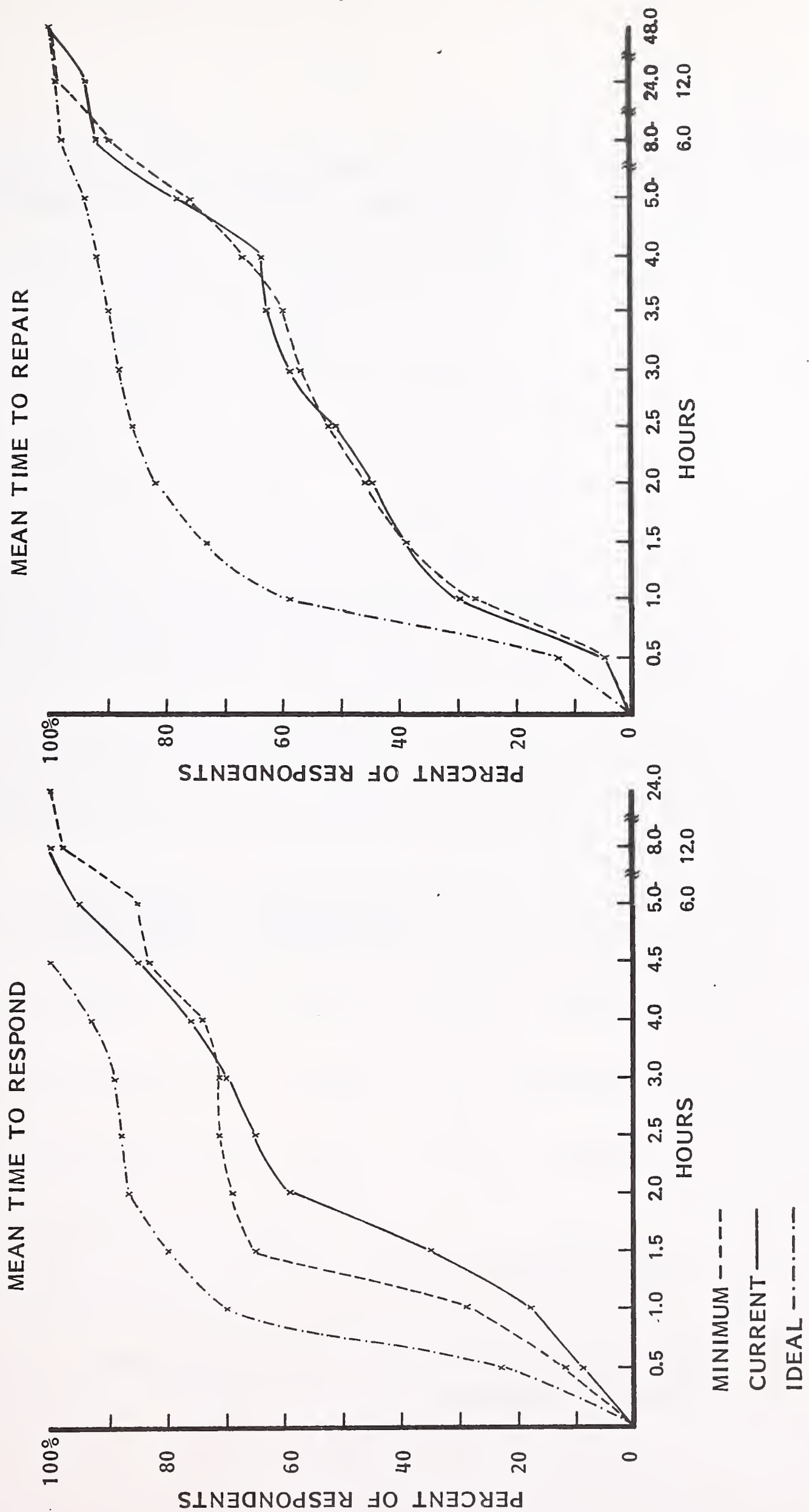
- Users' perceptions of their actual, ideal and minimum acceptable response and repair times are shown in Exhibit III-100.
- Ideally, the engineer should be on-site within four hours. However, the minimum acceptance and current curves, which remain close together for most of the time, indicate that it can take up to 12 hours to arrive. For 98% of respondents, this is the maximum time they would tolerate.
- Mean time to repair results produce some high ideals, although users are receiving the base minimum level of service that they consider tolerable. Although 88% of user respondents regard three hours as being ideal, 59% are receiving just that and 57% judge this to be the longest time acceptable.

EXHIBIT III-99

USERS' SATISFACTION WITH MAINTENANCE IN
NORWAY AND SWEDEN



HARDWARE EQUIPMENT MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR -
MINIMUM, CURRENT AND IDEAL FOR USER RESPONDENTS IN
NORWAY AND SWEDEN



- The table below shows what percentage of respondents actually receive what they feel to be ideal response and repair times, and what percent receive average times in excess of what they consider barely tolerable.

	<u>RESPONSE TIME</u>	<u>REPAIR TIME</u>
Satisfied	22%	19%
Dissatisfied	33%	37%

- Dissatisfaction runs higher than satisfaction among individuals. This is the reverse for Belgium and the Netherlands. The explanation for this is that the respondents from Norway and Sweden were giving very high ideal standards, but smaller differences between actual and minimum performance levels.
- Standards in the quality of field service engineers and their management are, in general, much the same today as in previous years, as the table below shows:

	<u>FIELD SERVICE ENGINEERS</u>	<u>FIRST LINE MANAGERS</u>
Same:	62.5%	79%
Improved:	25.0	8
Poorer:	<u>12.5</u>	<u>13</u>
	100.0%	100%

3. USERS' ATTITUDES TOWARDS THIRD-PARTY MAINTENANCE

- None of the respondents from Norway and Sweden was using third-party maintenance companies.

- Nearly half said they would consider using an organisation other than the equipment supplier as a maintenance vendor.
- The major reason was an expected cost saving, the average of which was 21%. Others mentioned the usual provisos:
 - 'If the third party is more experienced and qualified.'
 - 'If costs are not billed separately.'
 - 'If it were possible in Norway with IBM equipment.'
- One respondent mentioned an important point when considering the geographical hazards existing in these two countries:
 - 'We have terminals and minis installed at sites far away from the vendors' maintenance locations.'

4. USERS' SENSITIVITY TOWARDS MAINTENANCE PRICING

- Users were asked how they intended to react against rising maintenance costs. The question only evoked 10 responses and these are shown below:

-	Nothing	4
-	Do own maintenance	2
-	Replace old equipment	1
-	Holding spares and engineers in-house	2
-	Eliminating contracts	2

- When asked when this becomes a problem, almost half the respondents felt that the problem had already arisen.
- The following table shows how users perceive the prices to have risen, both in monetary terms and relative to the value of equipment:

	<u>Change in Cost</u>	<u>Average</u>	<u>Change Relative to Value of Eqpt:</u>	<u>Average</u>
Increased:	81%	15%	67%	8%
Same:	19	-	25	-
Decreased:	<u>-</u>	N / A	<u>8</u>	1*
	100%		100%	

*Only one respondent specified.

5. USERS' ATTITUDES TOWARDS REMOTE DIAGNOSTICS

- The use of a remote diagnostic facility experienced by four respondents had improved the quality of service according to two respondents, and lowered it in the opinion of a third.
- Vendors supplying the service include:
 - IBM (2 respondents).
 - Hewlett-Packard.
 - Univac.

- One respondent mentioned he was making a 10% cost savings as a result of having a remote diagnostic capability.
- Non-users were, in general, not averse to the idea, as 59% reacted positively.

6. USERS' PERCEPTIONS OF ESCALATION PROCEDURES

- Exactly one-third of respondents' vendors are providing a formal escalation procedure for their clients. Generally, users' opinions were favourable:
 - 'Faster throughput; more efficient.'
 - 'Working around the clock - repair time now reduced.'
- Non-users were rather skeptical, as 79% did not consider it would assist them.
- When asked whether they would prefer to buy products from a vendor providing a formal escalation procedure as a part of their maintenance activities, 47% responded positively.

7. USERS' COMMENTS ON MAINTENANCE IMPROVEMENT

- Users indicated they would like to see the following improvements in maintenance:
 - 'Higher quality of personnel.'
 - 'Local maintenance centre.'
 - 'On-site engineer.'
 - 'Remote diagnostics.'
 - 'Telephone consultation.'

- 'Reduction in response and repair time.'
- 'Fast error correction on systems software for minis.'
- 'Spare parts centre located either on-site or at least in the same locality.'

IV COMPARATIVE ANALYSIS OF IBM AND OTHER MAINTENANCE VENDORS

IV COMPARATIVE ANALYSIS OF IBM AND OTHER MAINTENANCE VENDORS

A. INTRODUCTION

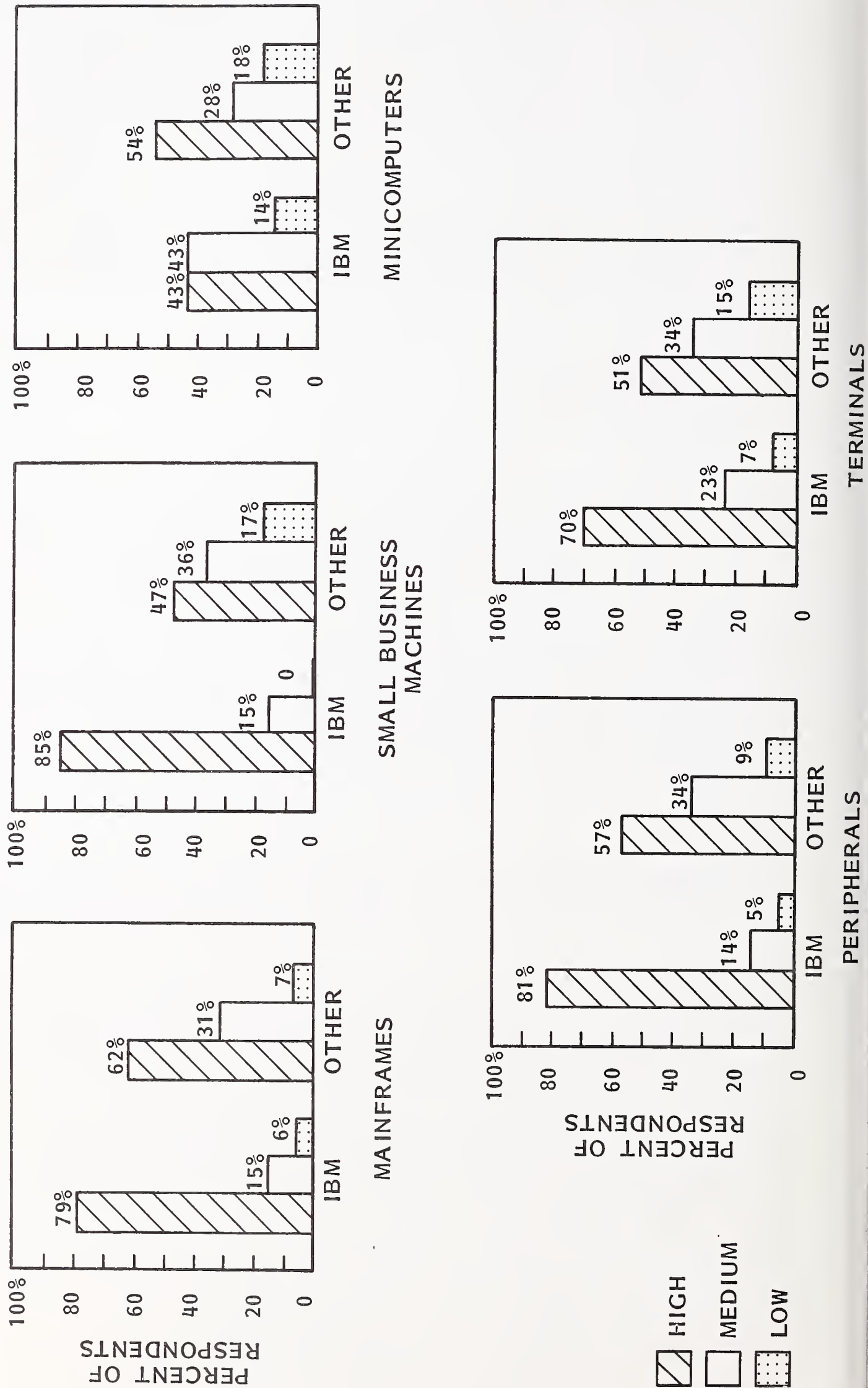
- As the dominant maintenance vendor among users surveyed, IBM influences on key indicators in the user survey have been separated to test for significant variances in user attitudes regarding maintenance vendors in general.
- Where users have provided specific information of general interest, the comments, equipment types and names of vendors are disclosed. The confidentiality of the vendors surveyed for Chapter V is not violated since only user responses are used.

B. USERS' GENERAL SATISFACTION WITH MAINTENANCE VENDORS

- As discussed in Chapter III, respondent users tended to award high marks to maintenance vendors. Separation of the IBM influence, as seen in Exhibit IV-1, indicates that IBM has raised the standard.
- In the area of minicomputers, however, IBM does not fare as well in terms of high marks received.

EXHIBIT IV-1

USERS' SATISFACTION WITH HARDWARE MAINTENANCE, IBM AND OTHERS



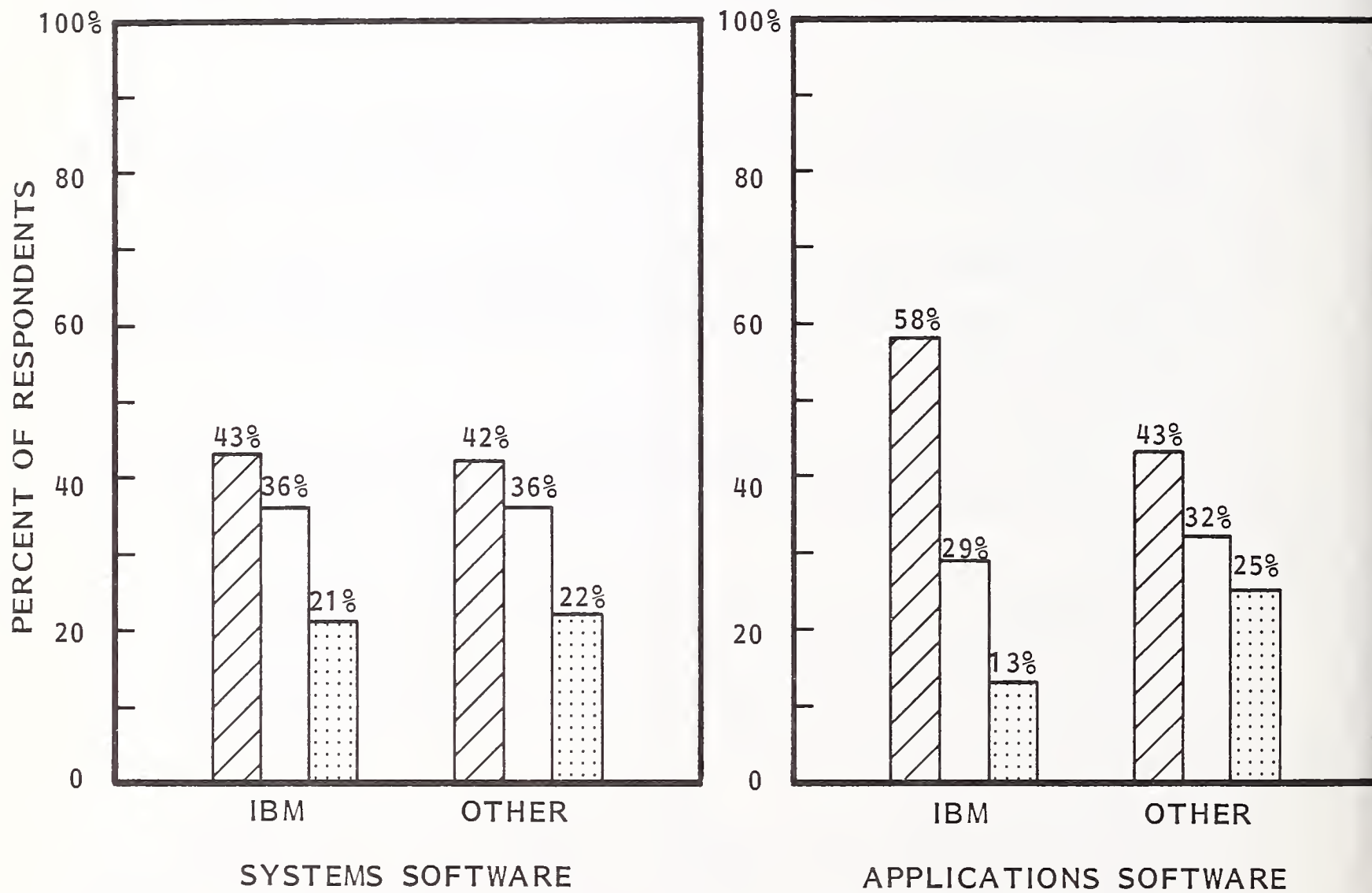
- The differences with reference to software maintenance, shown in Exhibit IV-2, are not nearly so marked. All vendors are virtually equal for systems software, with IBM slightly superior for applications software.

C. USERS' ATTITUDES TOWARDS MEAN TIME TO RESPOND AND REPAIR

- Exhibits IV-3 through IV-7 present data similar to those shown in Exhibits III-7 through III-11.
- Each category of mean time to respond and mean time to repair has been separately displayed to facilitate a comparison of other vendors with IBM.
- In the mainframe maintenance vendor category, shown in Exhibit IV-3, there appears to be no perceptible difference in users' attitudes towards IBM and non-IBM vendors.
 - IBM is marginally ahead, which is consistent with general attitudes observed in Exhibit IV-1.
- This slight IBM superiority is continued in Exhibit IV-4 with regard to mean times to respond; however, the situation is reversed concerning repair times. IBM shows a slightly lower standard than other maintenance vendors in the eyes of users of small business systems.
- A different situation again emerges in Exhibit IV-5, which concerns mini-computers. Mean times to respond are erratic, but generally the standard appears to be the same for IBM and non-IBM vendors.
- Minicomputer repair times, on the other hand, put IBM well ahead of its competitors.

EXHIBIT IV-2

USERS' SATISFACTION WITH SOFTWARE MAINTENANCE,
IBM AND OTHERS



MAINFRAME MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR, IBM AND OTHERS

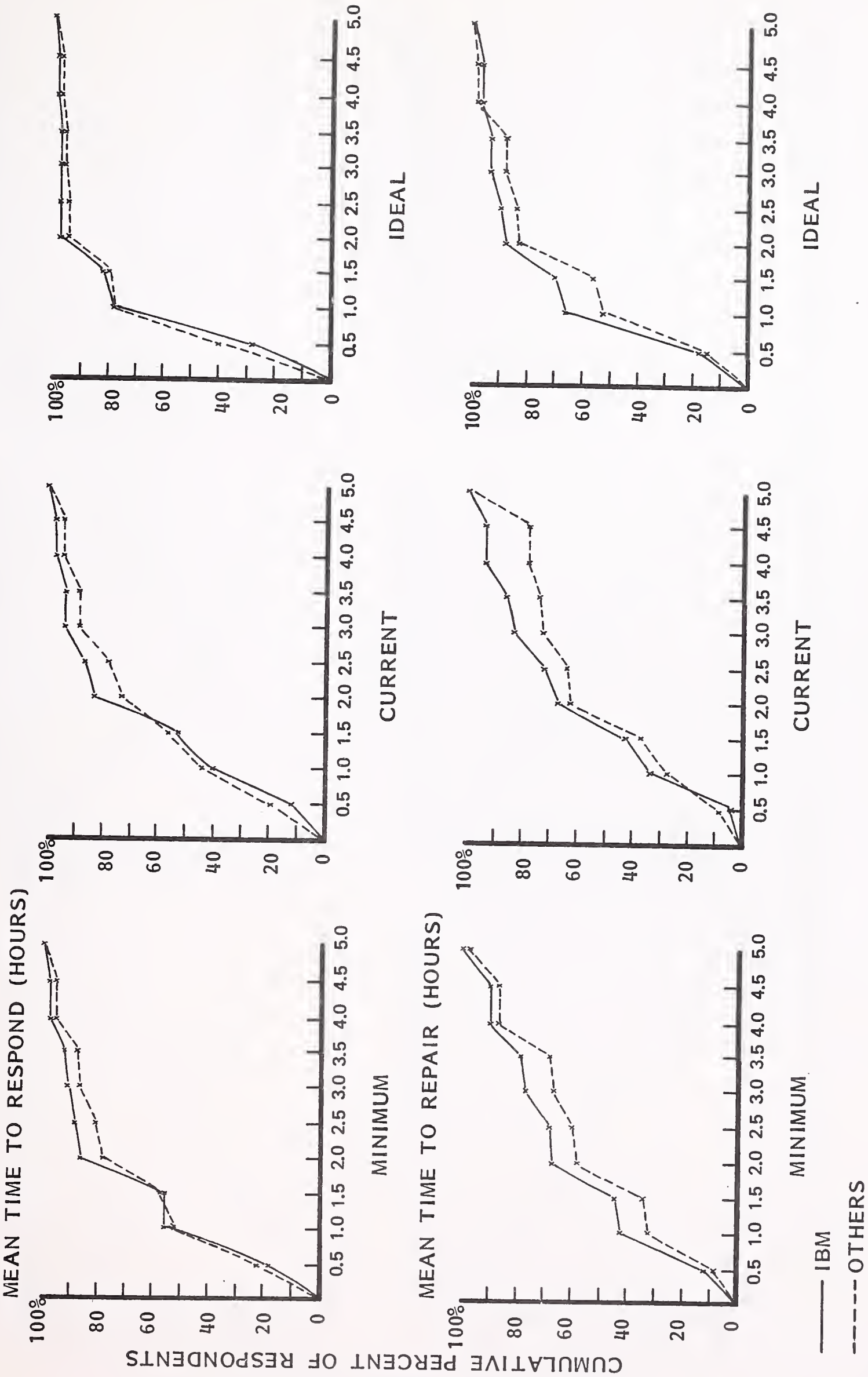
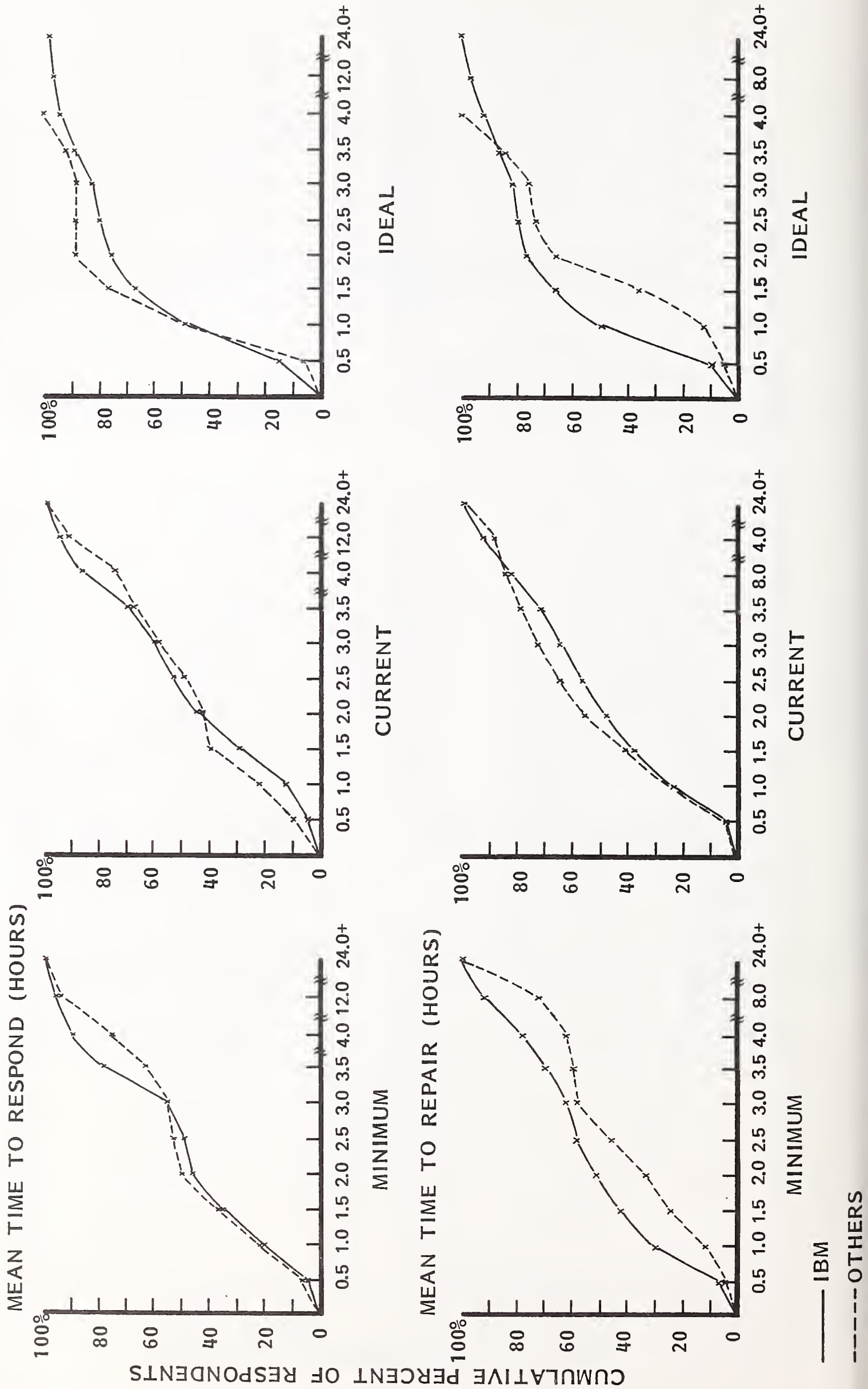
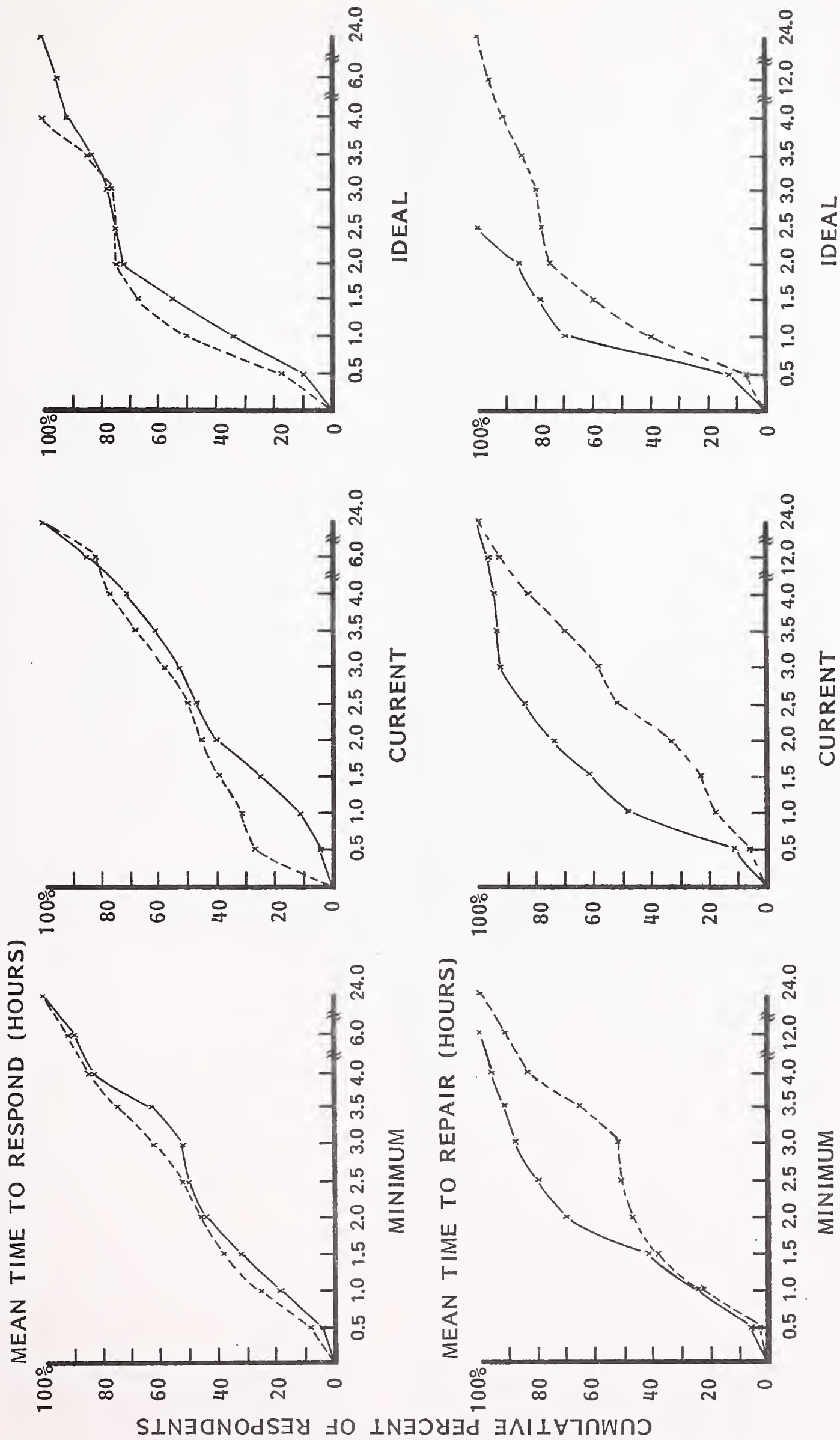


EXHIBIT IV-4

SMALL BUSINESS MACHINE MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR, IBM AND OTHERS



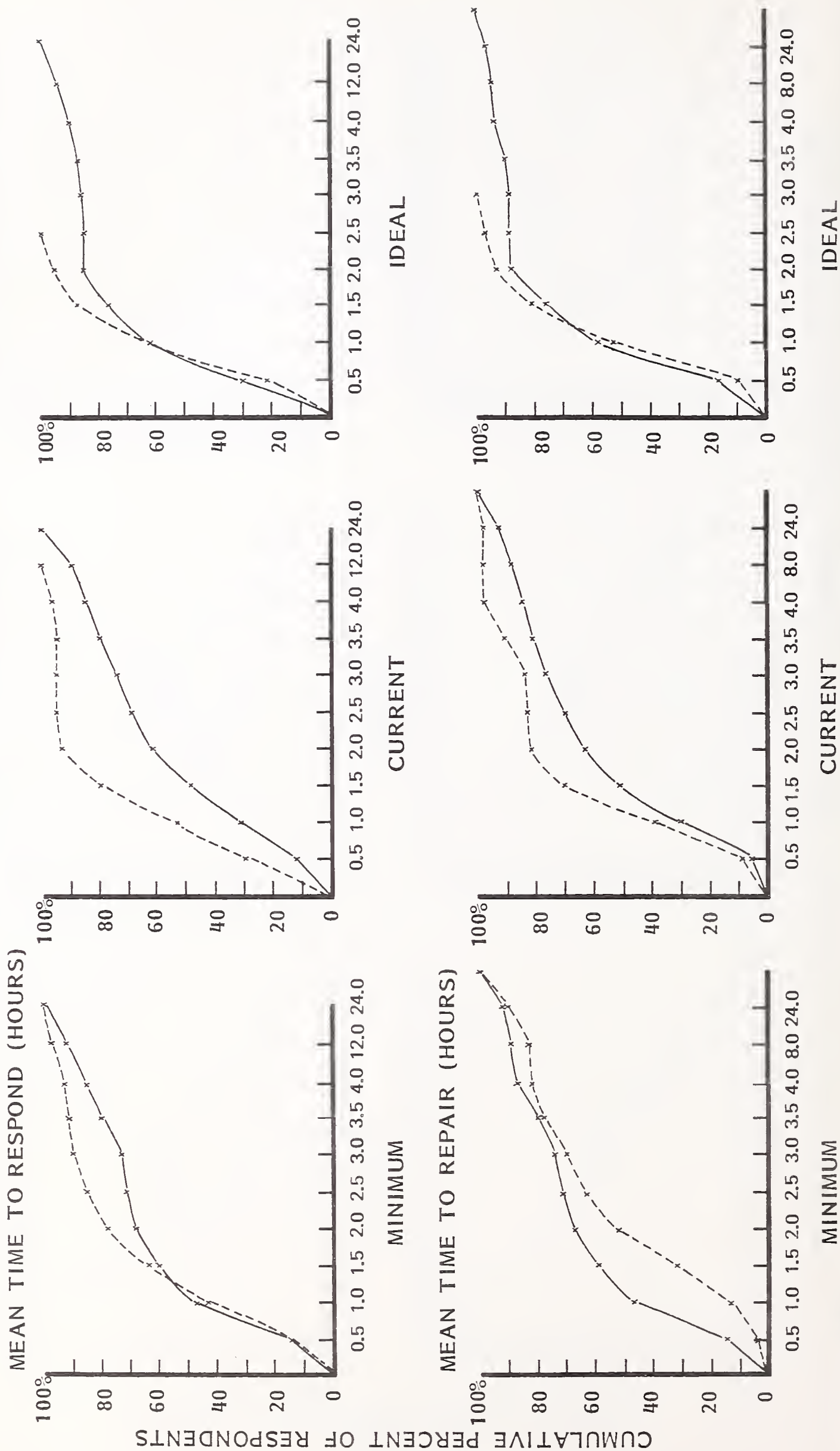
MINICOMPUTER MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR, IBM AND OTHERS



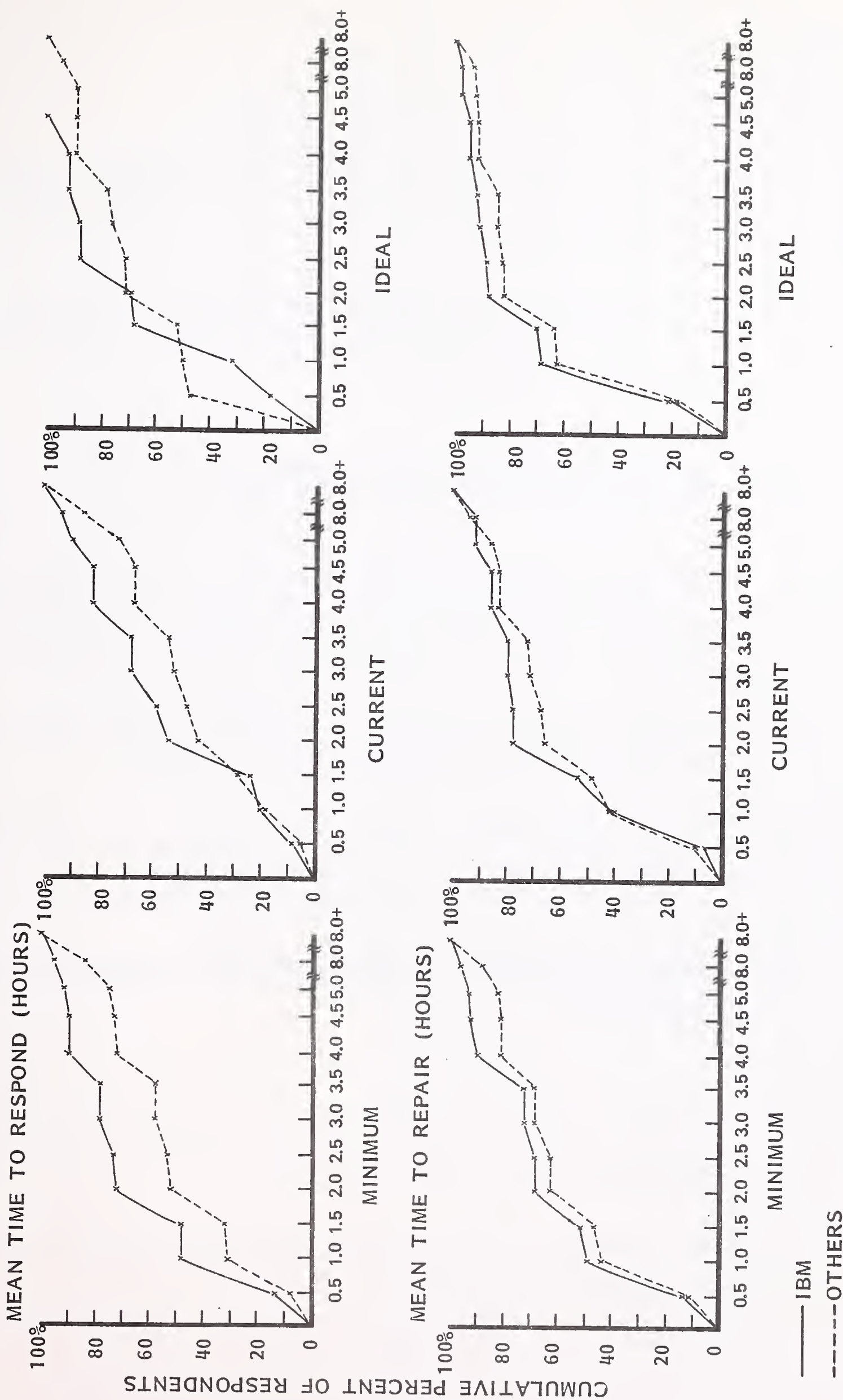
— IBM
--- OTHERS

EXHIBIT IV-6

PERIPHERAL MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR, IBM AND OTHERS



TERMINAL MAINTENANCE: MEAN TIME TO RESPOND AND REPAIR, IBM AND OTHERS



- Exhibit IV-6 again shows a slight lead for IBM for response and repair times of peripherals. This is more pronounced in the graph showing minimum acceptable performance levels.
- Terminal users also have high expectations of IBM, as indicated in Exhibit III-7. This is particularly predominant in response times for minimum performance and current levels.

D. REPLACEMENTS DUE TO POOR MAINTENANCE

- IBM equipment was replaced 1.6% of the times it was mentioned by users because of poor maintenance. Non-IBM vendors were replaced over twice as frequently as a group, with a total of 3.9%, as shown in Exhibit IV-8.
- Peripherals were exchanged most often over the past two years; IBM equipment did not escape being among the vendors concerned.
- IBM was more affected than any other vendor in terms of mainframes replaced, but the figure is so low as to be insignificant.

E. USERS' SATISFACTION WITH REMOTE DIAGNOSTICS AND ESCALATION PROCEDURES

- According to Exhibit IV-9, IBM users tend to be relatively non-committal concerning their views of how the advent of a remote diagnostic facility has affected their overall maintenance service.
 - Although 40% considered that there had been an improvement, 42% felt there was no difference.

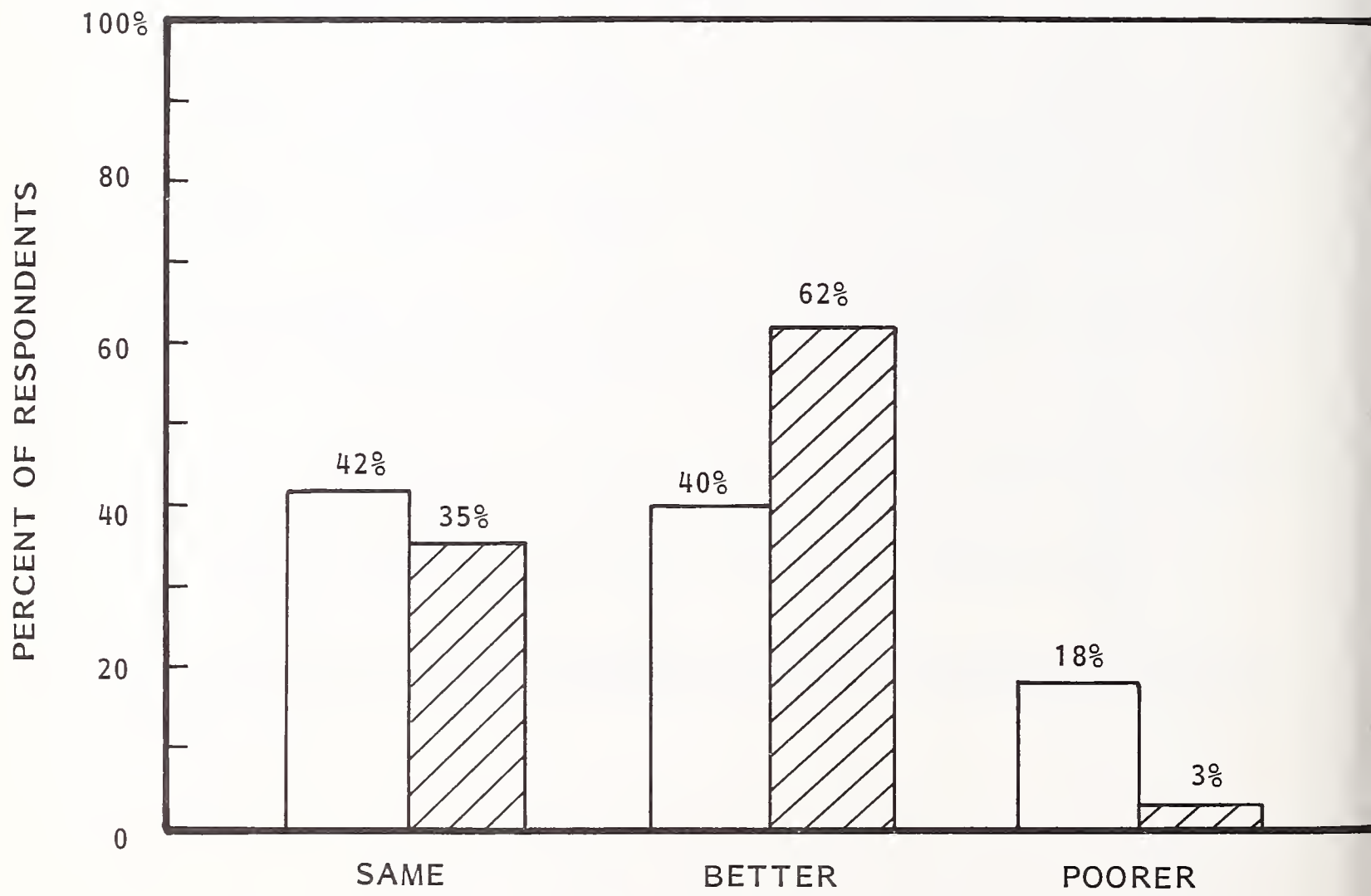
EXHIBIT IV-8

REPLACEMENT OF EQUIPMENT DUE TO POOR MAINTENANCE, IBM AND OTHERS

EQUIPMENT TYPE	IBM	OTHERS
MAINFRAMES	0.8%	0.4%
SMALL BUSINESS MACHINES/ MINICOMPUTERS	-	4.0
PERIPHERALS	9.7	12.2
TERMINALS	-	3.0
TOTAL	1.6%	3.9%

EXHIBIT IV-9

USERS' SATISFACTION WITH REMOTE DIAGNOSTICS,
IBM AND OTHERS



□ IBM (50 RESPONSES)
▨ OTHER (37 RESPONSES)

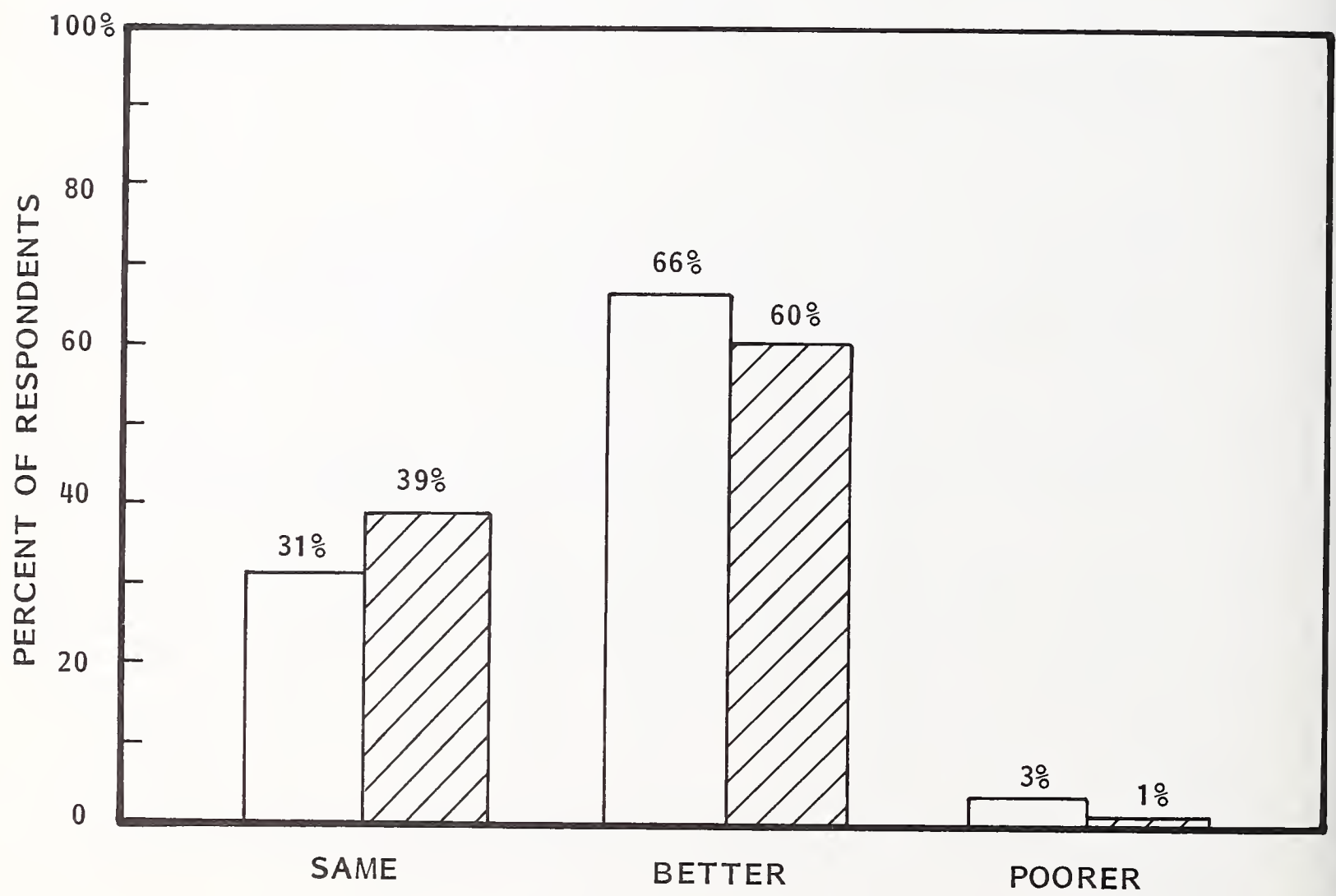
- Non-IBM vendors provided a generally higher rating, with 62% of respondent users seeing an improvement.
- Users whose vendors followed escalation procedures were asked to indicate their perceptions of changes in quality. The responses analysed have been interpreted to fit into one of the following three categories: same, improved, poorer.
- As seen in Exhibit IV-10, users view few differences between IBM and other vendors in the area of escalation procedures.

F. IBM'S IMPACT ON OTHERS

- IBM remains the dominant vendor for equipment and service. Users expect it to perform at a higher standard than others, and severely criticise it when not exceeding the expected performance of other vendors.
- Alert non-IBM maintenance vendors can take advantage of the 'underdog' syndrome by stretching actual performance beyond users' expectations.
- As new vendors become more visible, they are expected to move their own standards up to industry standards within a reasonable time.

EXHIBIT IV-10

USERS' SATISFACTION WITH ESCALATION
PROCEDURES, IBM AND OTHERS



V RESULTS AND ANALYSIS OF THE VENDOR SURVEY

V RESULTS AND ANALYSIS OF THE VENDOR SURVEY

A. VENDOR PROFILE

- The 41 vendors returning completed questionnaires (a copy of which is in Appendix E) are from the following regions:

-	France	3
-	West Germany	8
-	United Kingdom	14
-	Belgium and the Netherlands	6
-	Norway and Sweden	2
-	Multinational*	<u>8</u>
		41

*Organisations responsible for more than one country.

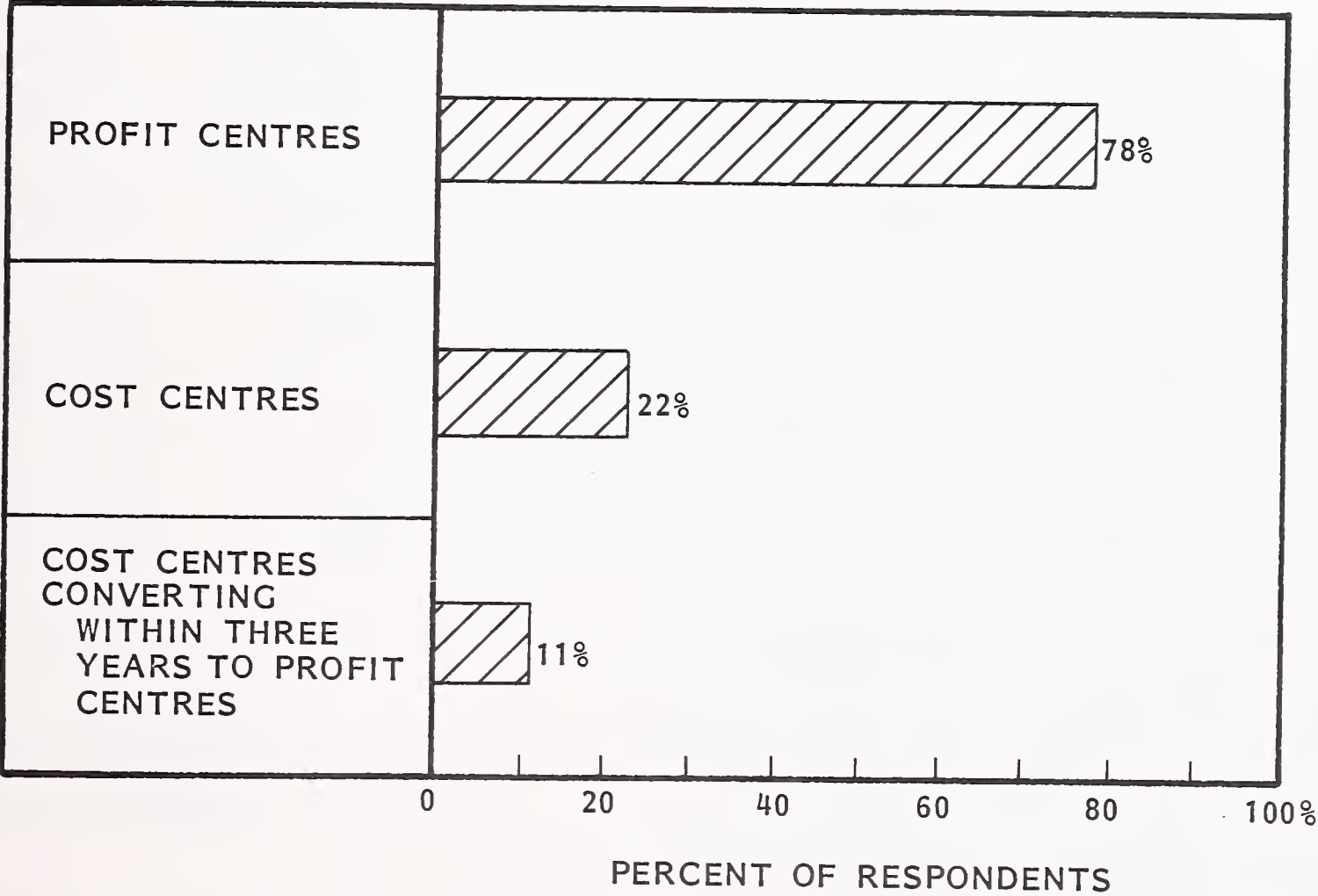
- The size of the field service organisations varied from a very small company with only 20 engineers to one having in excess of 3,000 engineers. The average size in Europe was 295 engineers, with the majority of responding vendors falling in the range of 100-150 engineers.

B. VENDOR ORGANISATIONAL STRUCTURE

- In 38 vendors, the Manager of Field Engineering or equivalent reports to the most senior company representative of that country or to a member of the company board of directors.
- Many of the field service managers for multinational companies had dual reporting functions:
 - To the country manager.
 - To a VP of engineering or equivalent, at the corporate level.
- This causes some split in loyalties and conflicts in reporting. Often these two will have different long- and short-term objectives which can place additional strains on the field service manager.
- However, the vast majority of vendors recognise the growing importance of their field service organisations as an increasing number become profit-orientated operations.
- Of the 41 vendors sampled, 32 were profit centres and half of the remaining eight would change to profit centres within the next three years, as illustrated in Exhibit V-1.
- One vendor, very reluctant to become a profit centre, said, 'Field service is hard enough without having to make money at it!' While this vendor has our sympathy, the increasing portion of corporate revenue attributed to field service compels the field service organisations to become profit-orientated.
- A German vendor commented that he had been a profit centre for over a year but had not yet made a profit.

EXHIBIT V-1

VENDORS'
PROFIT OR COST
CENTRES



- This highlights the error many corporate executives make in simply designating the field service operation a profit centre in hopes that it will convert from a loss leader to profitability overnight.
- Many field engineering managers become involved in a game of 'funny money', covering losses with other revenue activities such as spares sales to OEM customers.
- Profit margins showed wide variations; the European average profit being 17.8%.
 - The profit objectives for the countries studied were:

. West Germany	10%
. France	20
. United Kingdom	15
. Belgium and the Netherlands	20
. Norway and Sweden	10
. Multinational	19
- The dynamic character of field service organisations is evident in the fact that 58% of the respondent vendors undertook major structural changes during the past year. Some of the changes mentioned were:
 - 'Three new district service managers.'
 - 'Totally new organisation.'
 - 'Combined spares sales and service into one organisations.'

- 'Creation of Belgium and the Netherlands companies.'
 - 'Split into two main product lines.'
 - 'Systematised field service.'
 - 'Decentralised spares and repair.'
 - 'Now have regional managers.'
 - 'New dispatching system.'
 - 'Creation of support centres.'
 - 'New regional boundaries.'
 - 'Inclusion of customer service; i.e., training and software support.'
 - 'Consolidation of support functions.'
 - 'From cost to profit centre.'
 - 'A logistics system at last.'
- Nineteen of the respondent vendors report increases in the number of field engineering offices. An average of three new offices were created by these companies.
 - One vendor reported a decrease of field engineering offices despite the fact that his engineering force had increased by some 8% to 120 engineers.
 - Distribution of personnel within each of the respondent vendor organisations varied considerably with no discernable pattern. To an extent this is undoubtedly due to differences in job descriptions among respondents.

- Exhibit V-2 shows that the front-line troops make up 86% of the total personnel assigned to service departments, while 5% are senior engineers providing a technical support function. The remaining 9% is made up of managers (5%) and administration (4%).
- In the coming year, INPUT foresees this distribution changing with an increase in low-level engineers and administration staff, while the number of technical support engineers decreases. These changes are a result of remote diagnostic techniques, improved mean time between failures (MTBF) due to greater reliability and the use of redundant circuit design techniques.
- Administrative support functions for field service organisations vary.
 - Some vendor organisations have their own administrative support functions in finance, accounting, personnel, training, logistics and continuation engineering.
 - Other vendors have minimal or no administrative personnel and depend on a central corporate support function.
 - With direct profit responsibility, the field manager must choose between the cost of having his own administrative staff and negotiating an allocation of the corporate overhead. It is attractive to have the administrative people under one's direct control, but this can prove expensive when compared to buying a part of an administrative team.

C. PERSONNEL GROWTH AND TURNOVER

- The average new hires reported by vendors were 36%, with separations running at 10%, showing a net gain of some 26% in the size of field service organisations. Exhibits V-3 through V-6 show responses by country.

EXHIBIT V-2

TYPICAL FIELD SERVICE ORGANISATION

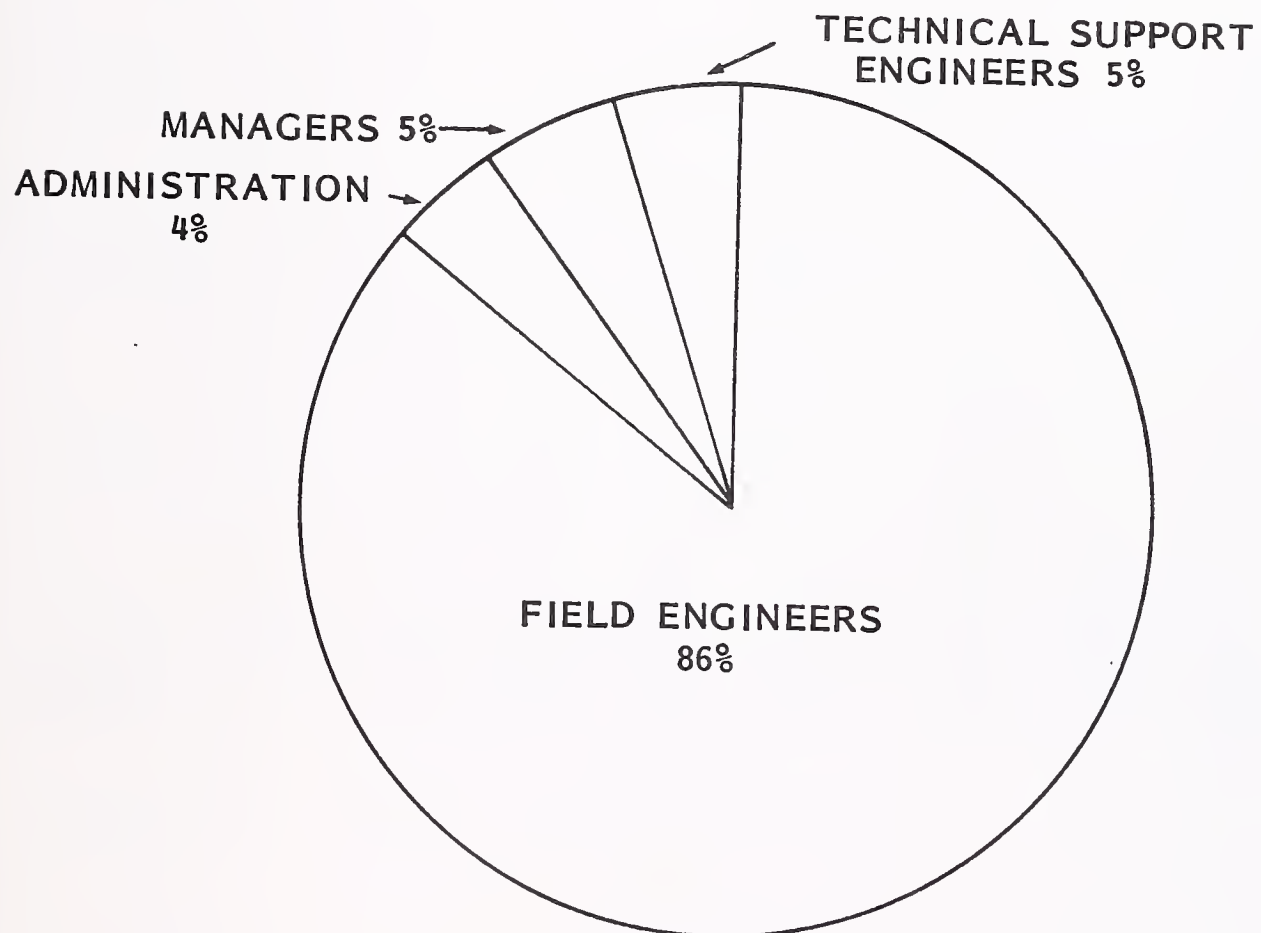


EXHIBIT V-3
COMPARISON OF FE NEW HIRES AND SEPARATIONS - 1979
WEST GERMANY

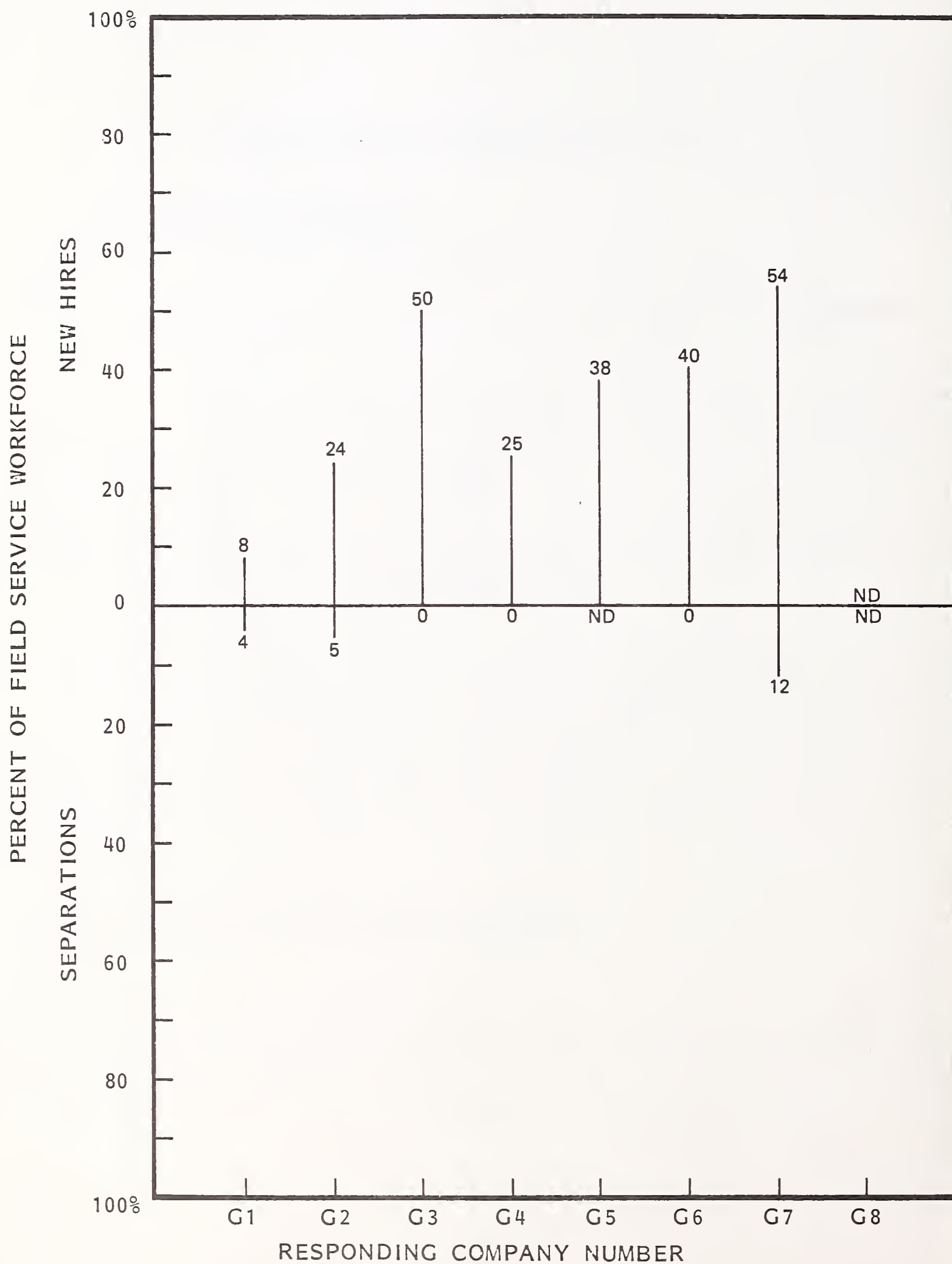
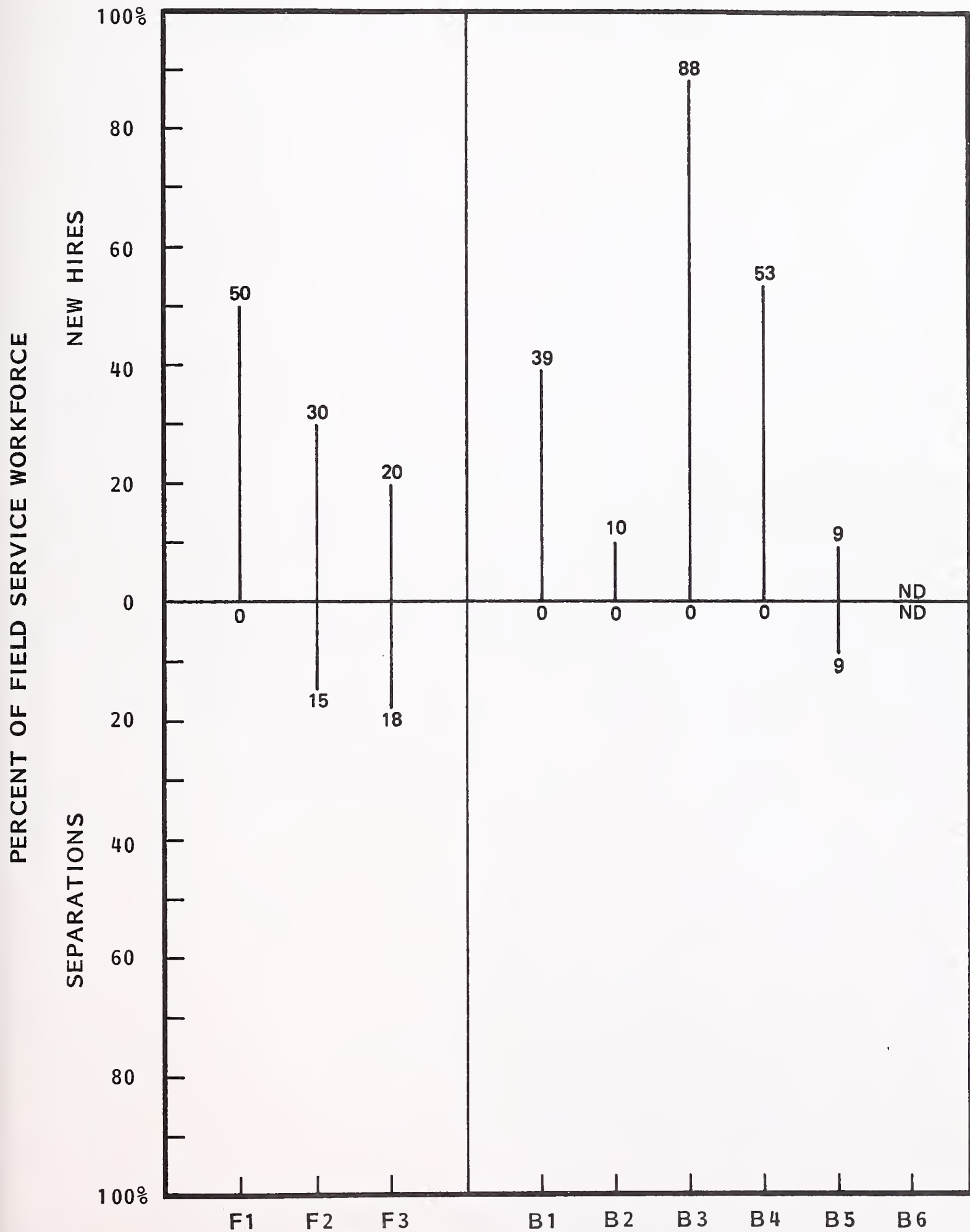


EXHIBIT V-4

COMPARISON OF FE NEW HIRES AND SEPARATIONS - 1979 FRANCE, BELGIUM AND THE NETHERLANDS



RESPONDING COMPANY NUMBER

EXHIBIT V-5
COMPARISON OF FE NEW HIRES AND SEPARATIONS - 1979
UNITED KINGDOM

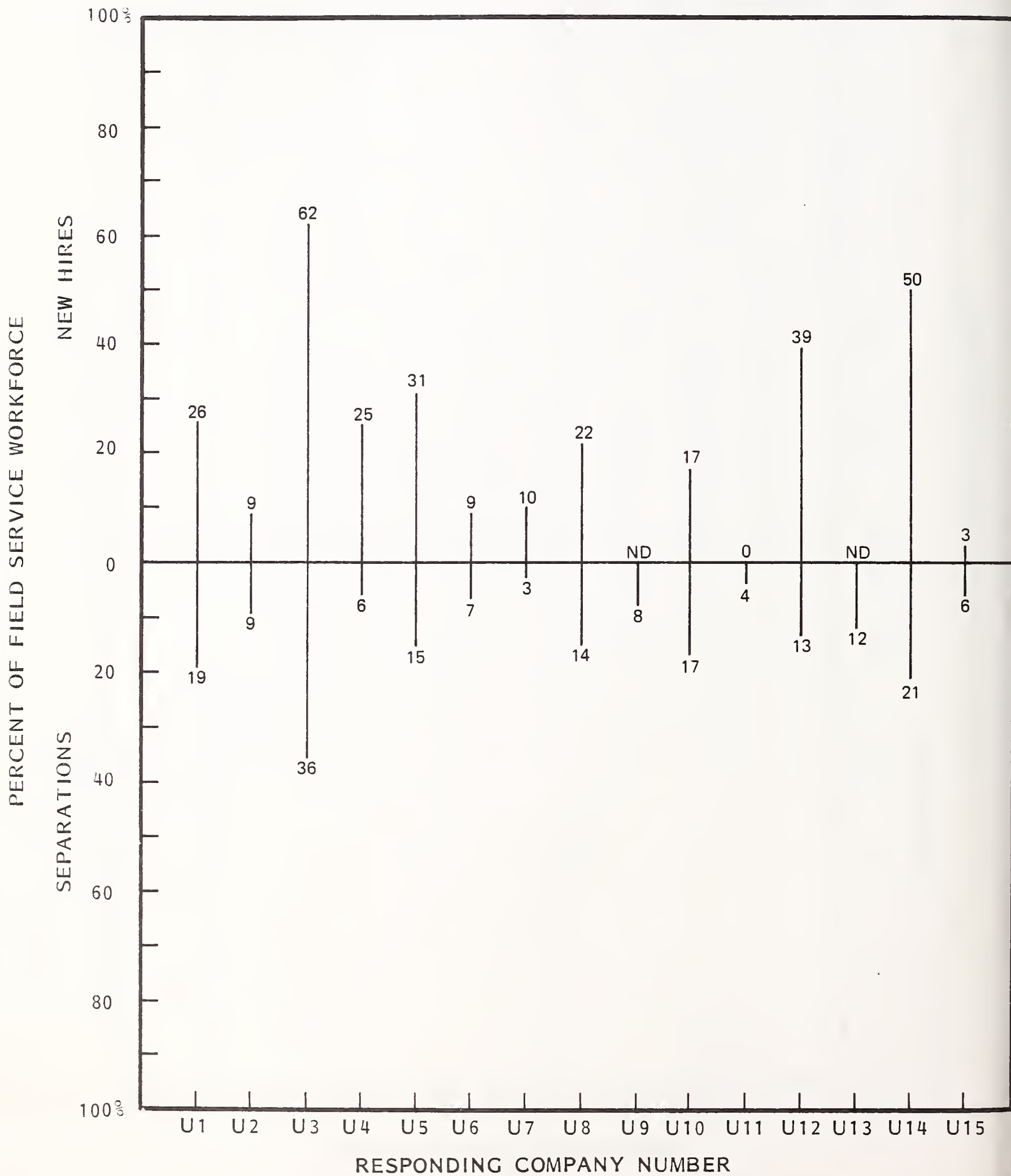
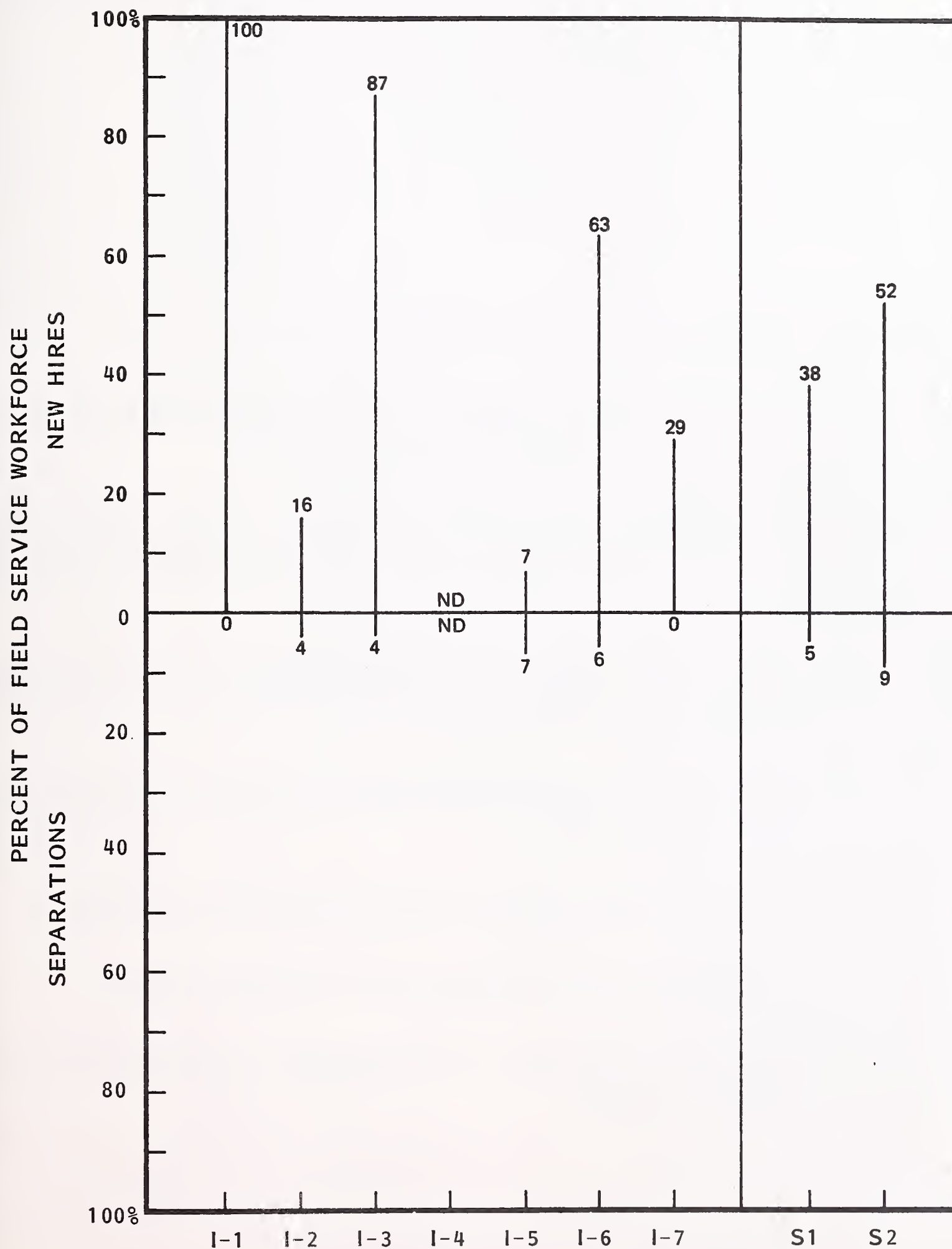


EXHIBIT V-6
 COMPARISON OF FE NEW
 HIRES AND SEPARATIONS - 1979
 MULTINATIONAL, NORWAY AND SWEDEN



RESPONDING COMPANY NUMBER

- Small organisations of less than 100 report the most dramatic increases in size. The differences among national organisations are small, though multinational groups grew at twice the national rate. The average increase for small companies by country was:
 - West Germany 41%
 - France 40
 - United Kingdom 33
 - Multinational 77
- The continuing shortage of engineers is a serious problem and is limiting the growth and expansion of many field service organisations.
- Attrition continues to be an ongoing problem for a number of field service vendors. Attrition rates between 4% and 8% are considered normal and healthy.
 - Seven of the 40 respondent vendors reported attrition rates in excess of 14%, the highest being 32%.
 - A 32% attrition rate means that they are turning over their engineering force every two years!
- The continuing shortage of good field engineers contributes to instabilities.
 - Poaching of competitors' engineers is fair game in the industry.
 - Surprisingly, there has been little exploitation of this situation by the engineers themselves.

- Moving to another company is still a reaction to an event and normally a last effort in increasing salary.
- One byproduct of the shortage of good top engineers is that when one threatens to leave, he is often retained by a 'special deal' agreement. These special deals, be they an incentive for more training, special arrangements on expenses, cars or similar financial benefits, are difficult to administer and control. Once these deals start to become known they can cause disaffection and disillusionment with other engineers.
- Attrition was attributed to many factors, as the following comments reflect:
 - Money (common).
 - Change of location (common).
 - Job satisfaction.
 - Lack of job mobility.
 - Conflict with management.
 - Promotional disappointment.
 - Deadwood.
 - Lack of prospects.
 - Motivation.
 - Planned replacements.
 - Lack of company car.

- Dissatisfaction.
- Boredom.
- Only two of the 41 responding vendors did not predict an increase in the number of engineers required for 1980. Of the 39 vendors stating that their organisations would expand, the average increases for Western Europe were 26%, breaking down as follows:
 - France 30%
 - West Germany 22
 - United Kingdom 18
 - Belgium and the Netherlands 25
 - Norway and Sweden 29
 - Multinational 43
- Reasons and comments given for personnel growth included:
 - 'Still rapidly expanding.'
 - 'More systems in the field.'
 - 'New business.'
 - 'Phase out any third-party maintenance.'
 - 'Revenue growth.'
 - 'We still maintain mechanical products.'

- 'Improved field service opportunities.'
- 'Rapid growth of microcomputers.'
- 'Demand for used processors is out of sight.'
- The vendor respondents to the survey did not adequately represent the large mainframe vendors who are forecasting little or no personnel growth. Since a great proportion of current FEs are currently employed by these vendors, the survey responses greatly overstate the actual average growth for the total industry.
- Taking these factors into account, INPUT estimates that the overall growth in numbers of engineers per company will be 5.2% in 1980.
 - This trend is expected to persist into the mid-1980s but by smaller percentages each year. However, the overall effect on the total number of engineers is less, due to the large organisations' concentration on productivity.

D. SOURCES OF NEW FIELD SERVICE PERSONNEL

- The three prime sources of new field service engineers are shown in Exhibit V-7.
- The primary source of engineers in 1980 has been from the competition.
- Traditionally, the armed forces had been a substantial provider of 'basic' qualified engineers, but this greatly reduced reservoir is forcing vendors to look to other sources.

EXHIBIT V-7

VENDORS' RATINGS OF
PRIMARY SOURCES OF NEW FIELD SERVICE PERSONNEL

VARIABLE	YEAR		DIFFER- ENCE
	1980	1985	
HIRE AND TRAIN (NO TECHNICAL PRE-TRAINING)	2.18	3.06	+0.88
RECRUIT FROM COMPETITION	3.04	2.74	-0.30
RECRUIT FROM INDUSTRIES	2.24	2.38	+0.14
TRAIN DISCHARGED ARMED SERVICES PERSONNEL	1.9	1.84	-0.06
RECRUIT FROM OTHER FUNCTIONS WITHIN THE COMPANY	1.66	1.62	-0.04
TRADE SCHOOLS	2.14	2.42	+0.28

- By 1985 vendors predict that the prime source of engineers will be to recruit and train direct from school, moving from third place in 1980 to first place in 1985.
- Also by 1985, vendors will be aiming their sights much higher, hoping to recruit far more university graduates.
- Recruitment from within the company is low and more often engineers are lost to other groups, such as sales or software support.
- Often the more extroverted engineer moves to the sales force or more 'glamorous careers', reducing a much needed customer relations resource. This is a problem engineering management must address as these very people are needed to ensure the correct 'marketing' of field service. Field service needs these good communicators.

E. FIELD ENGINEERING SALARIES

- To allow a comparison of salaries within Europe, they have been converted to U.S. dollars using 1980 rates.
- These average salaries are graphically illustrated in Exhibits V-8 through V-10.
- The average base salaries paid to trainees by respondent vendors were:

	<u>Average</u>	<u>Range</u>
- France	\$14,600	\$11,300-21,700
- West Germany	15,100	12,600-18,900
- United Kingdom	11,400	7,300-20,200

EXHIBIT V-8

ANNUAL SALARY OF AVERAGE TRAINEE:
FRANCE, BELGIUM AND THE NETHERLANDS, NORWAY AND SWEDEN

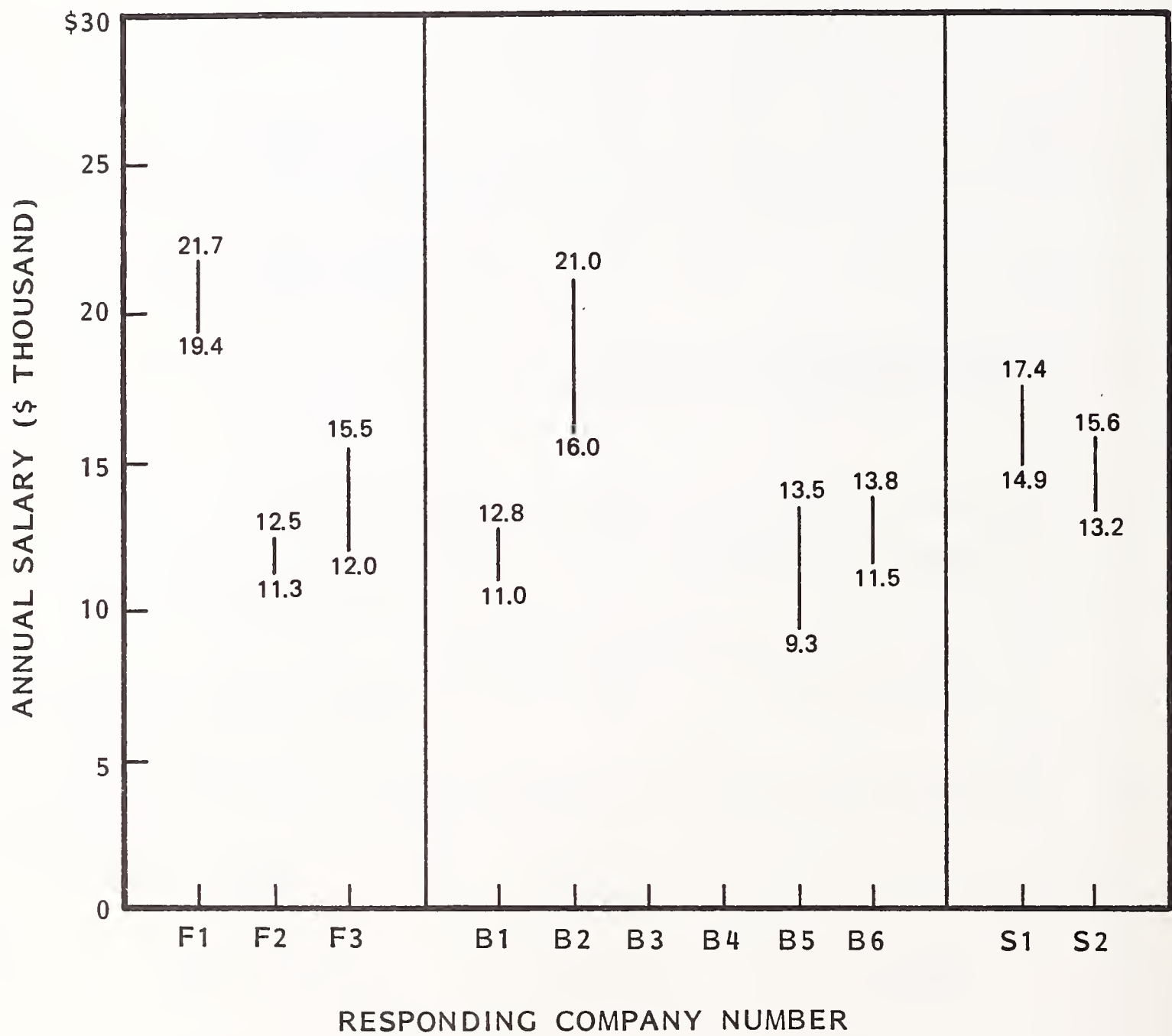


EXHIBIT V-9

ANNUAL SALARY OF AVERAGE TRAINEE:
WEST GERMANY AND MULTINATIONAL

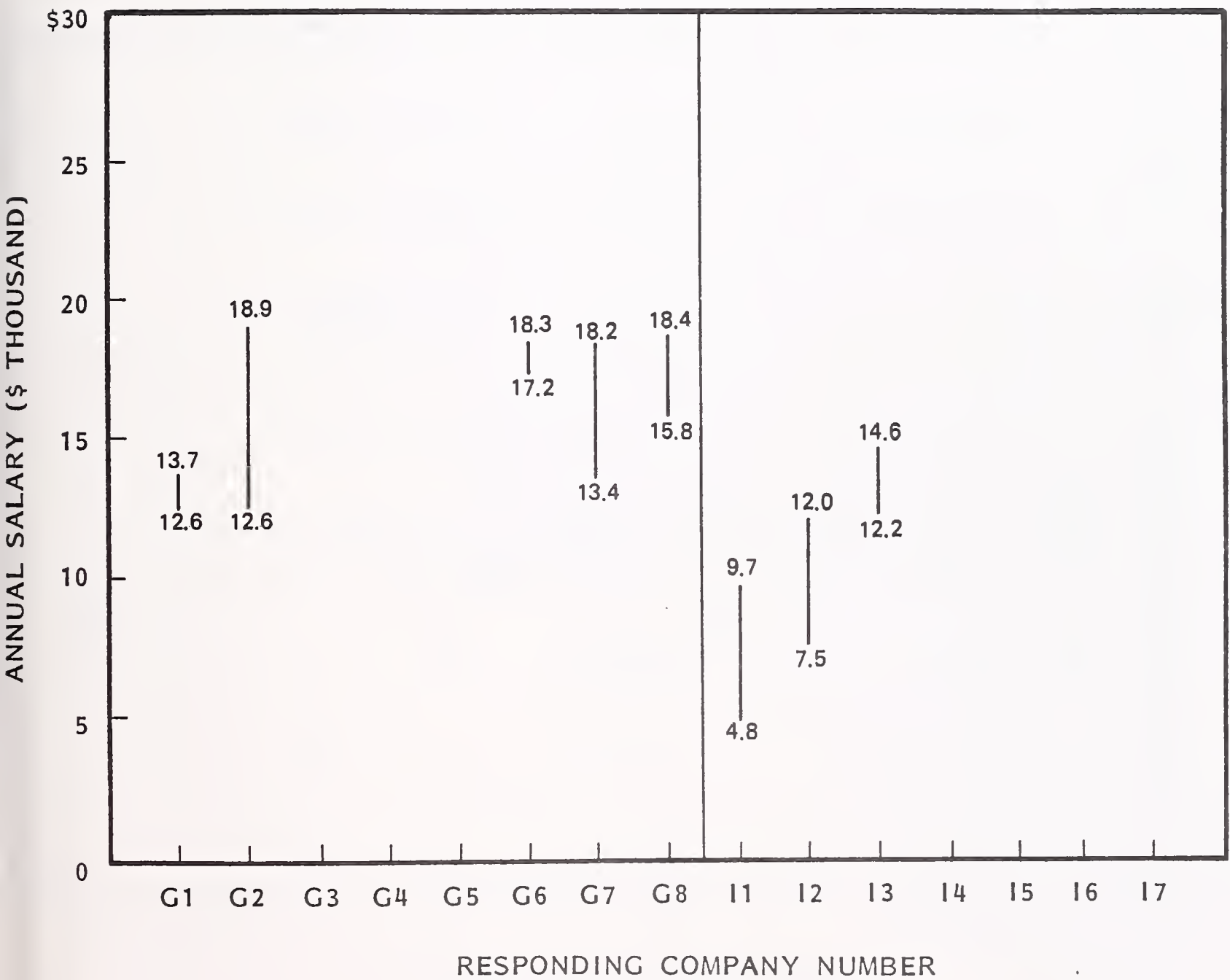
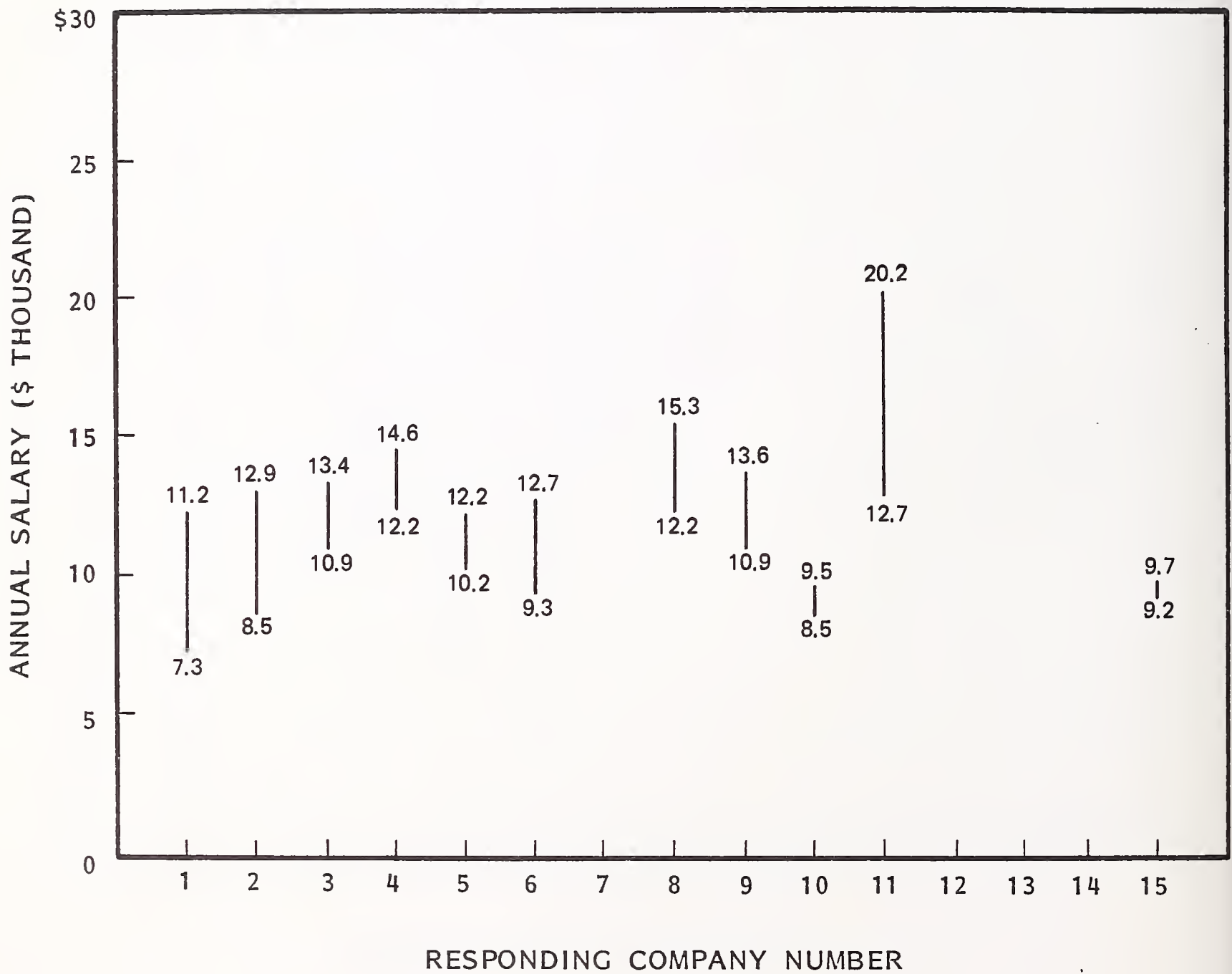


EXHIBIT V-10

ANNUAL SALARY OF AVERAGE
TRAINEE: UNITED KINGDOM



-	Belgium and the Netherlands	\$12,700	\$ 9,300-21,000
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-	Norway and Sweden	14,400	13,200-17,400
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- Base salary averages for qualified field engineers for respondent vendors, as shown in Exhibits V-11 through V-13, were:

	<u>Average</u>	<u>Range</u>
- France	\$19,000	\$12,000-32,000
- West Germany	17,400	13,200-28,900
- United Kingdom	14,300	10,200-21,900
- Belgium and the Netherlands	15,600	11,300-17,900
- Norway and Sweden	18,600	16,800-20,700

- The annual salaries of senior engineers (referred to by one vendor as the 'creme de la creme') shown in Exhibits V-14 through V-16 were:

	<u>Average</u>	<u>Range</u>
- France	\$24,000	\$13,000-50,300
- West Germany	22,000	20,000-26,700
- United Kingdom	18,900	12,500-26,800
- Belgium and the Netherlands	19,000	13,600-24,200
- Norway and Sweden	23,000	17,500-24,800

EXHIBIT V-11

ANNUAL SALARY OF AVERAGE QUALIFIED FE:
FRANCE, BELGIUM AND THE NETHERLANDS, NORWAY AND SWEDEN

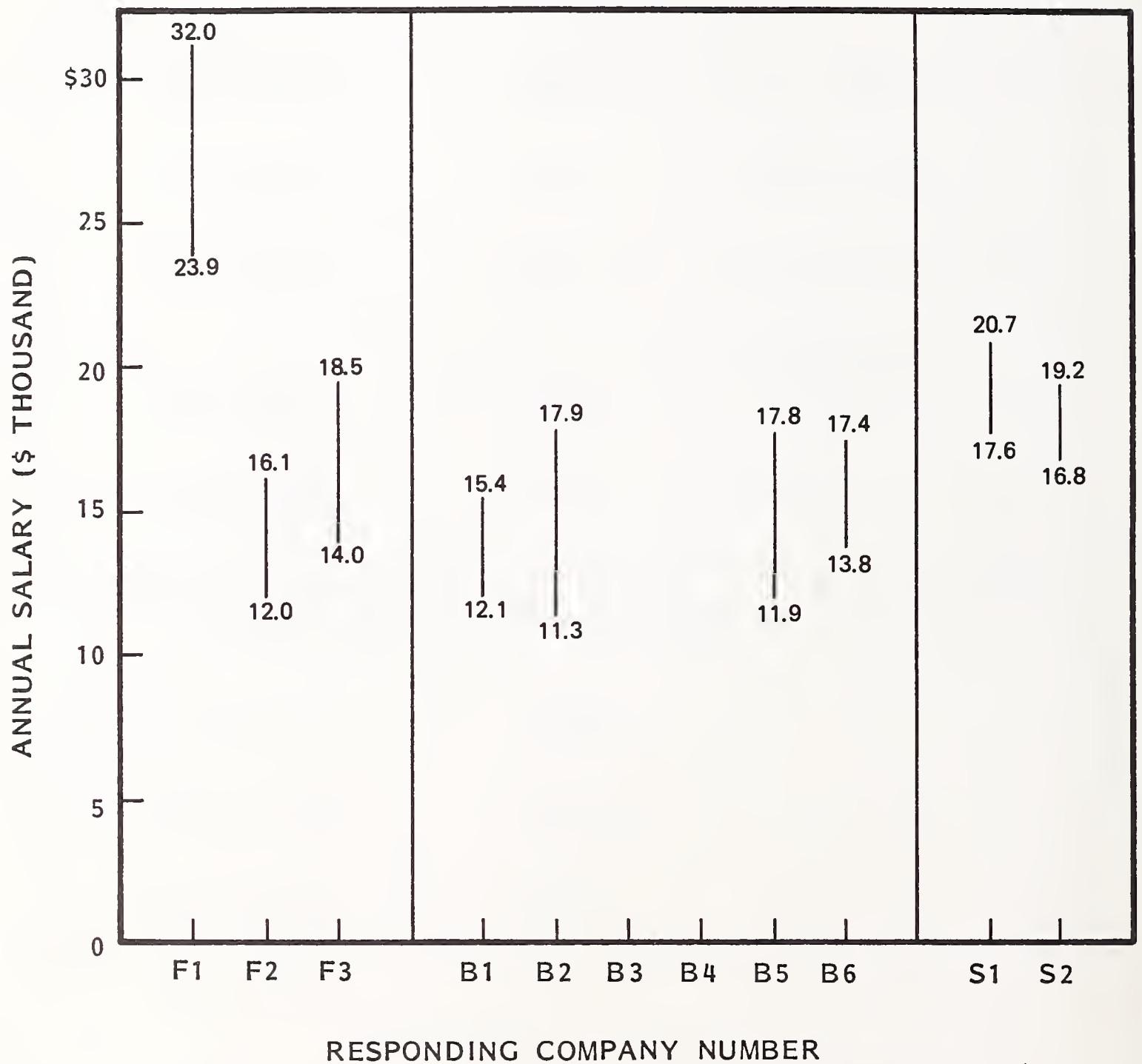


EXHIBIT V-12

ANNUAL SALARY OF AVERAGE QUALIFIED FE:
WEST GERMANY AND MULTINATIONAL

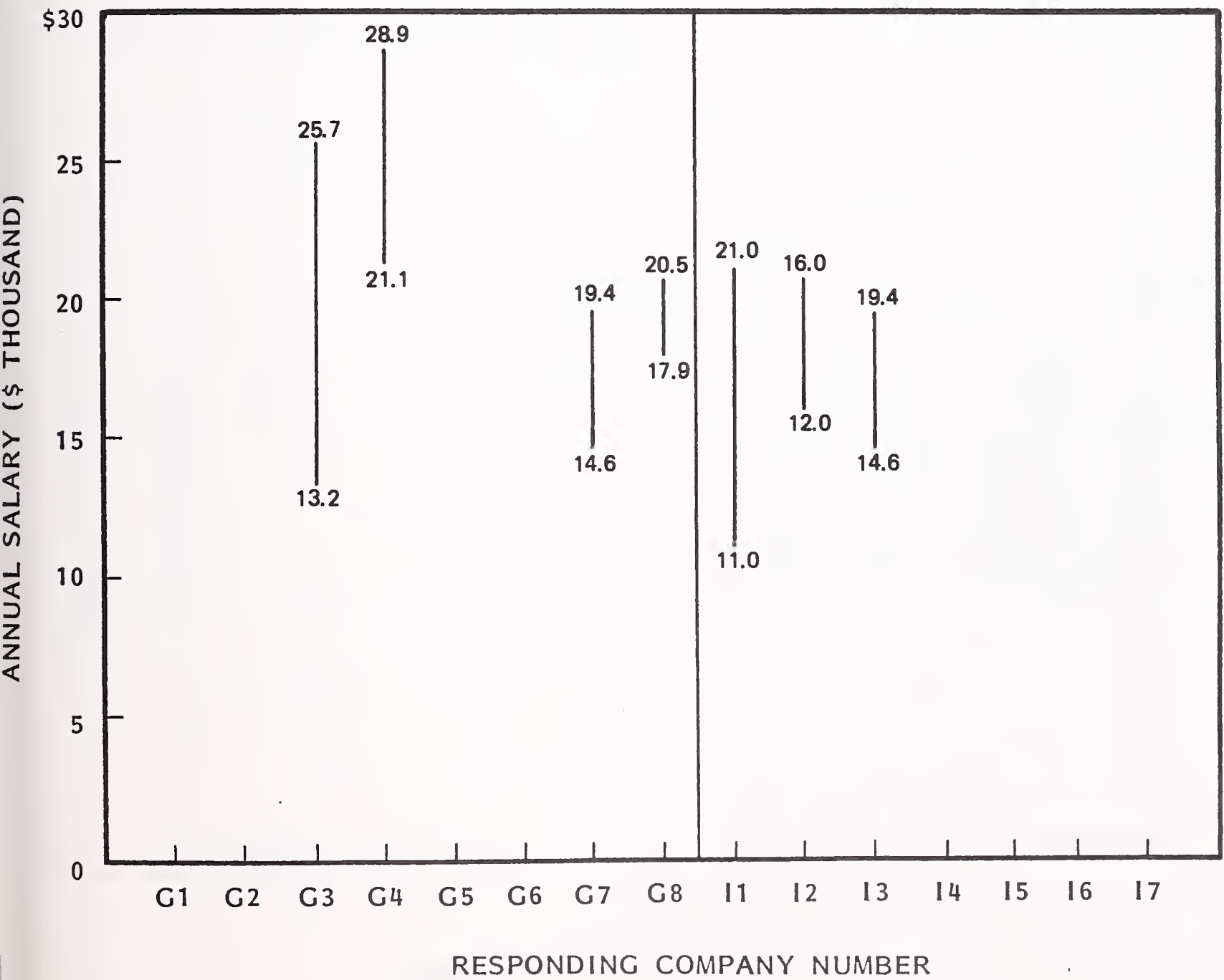


EXHIBIT V-13

ANNUAL SALARY OF AVERAGE QUALIFIED FE: UNITED KINGDOM

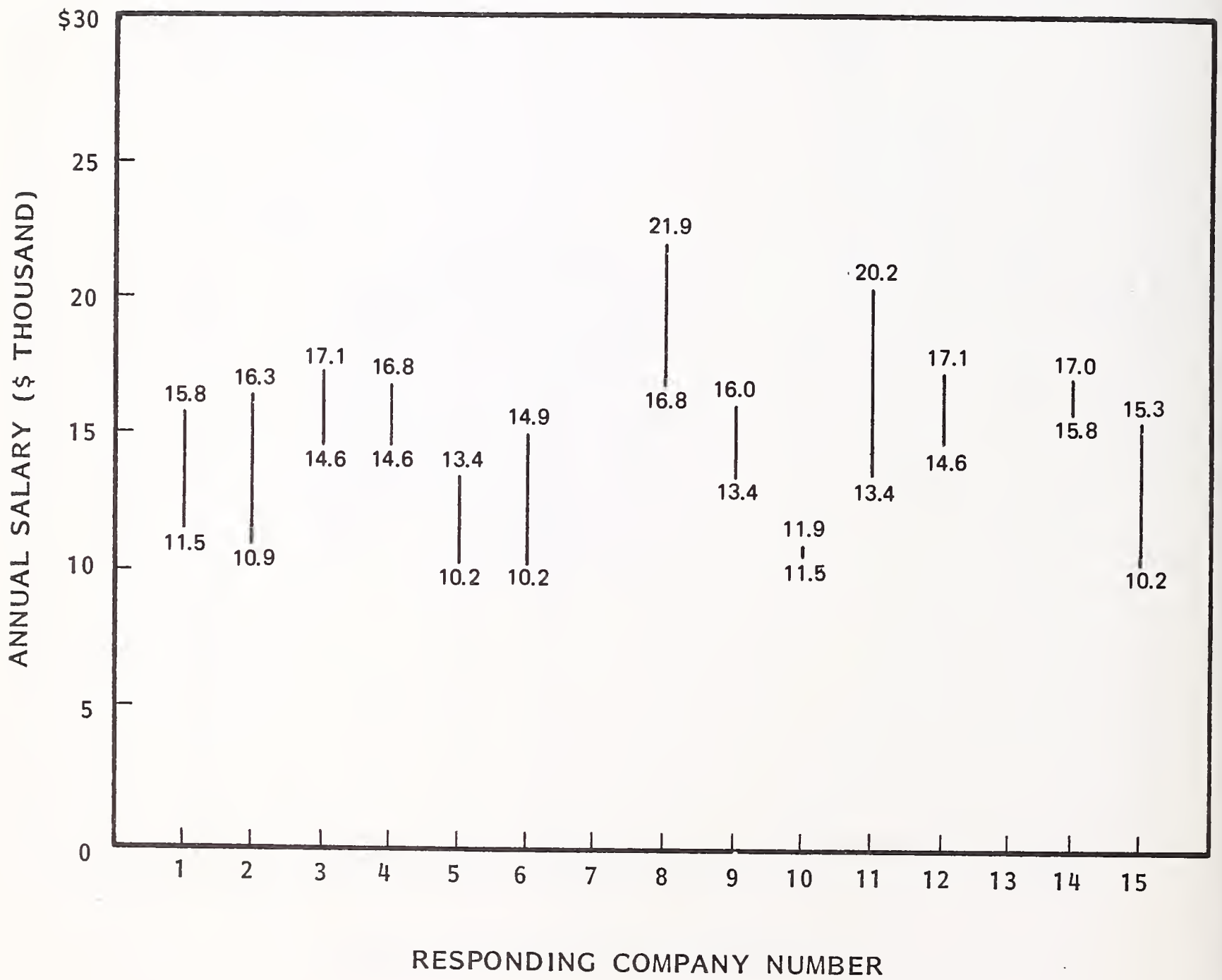


EXHIBIT V-14

ANNUAL SALARY OF AVERAGE SENIOR FE:
FRANCE, BELGIUM AND THE NETHERLANDS, NORWAY AND SWEDEN

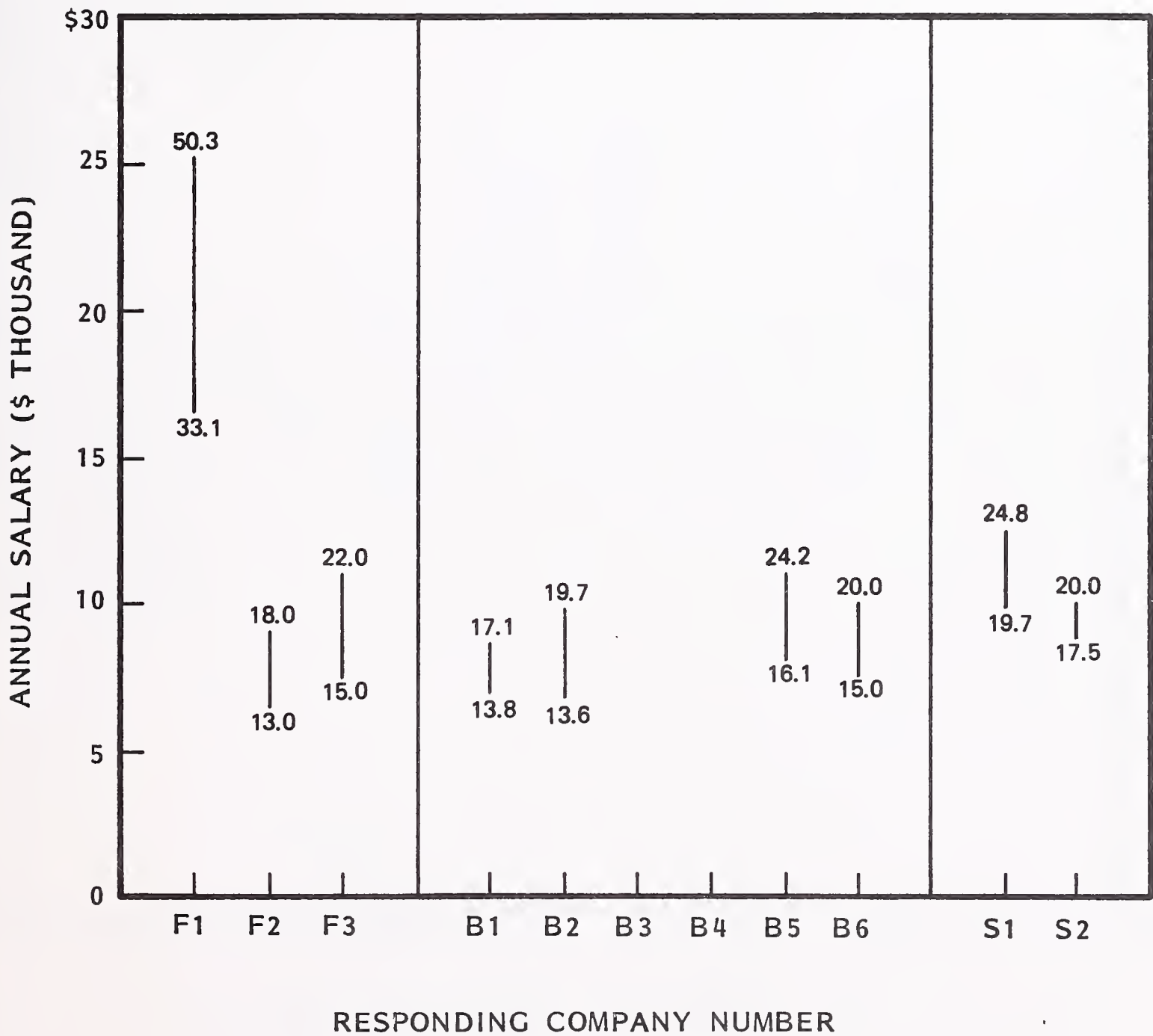


EXHIBIT V-15

ANNUAL SALARY OF AVERAGE SENIOR FE: WEST GERMANY AND MULTINATIONAL

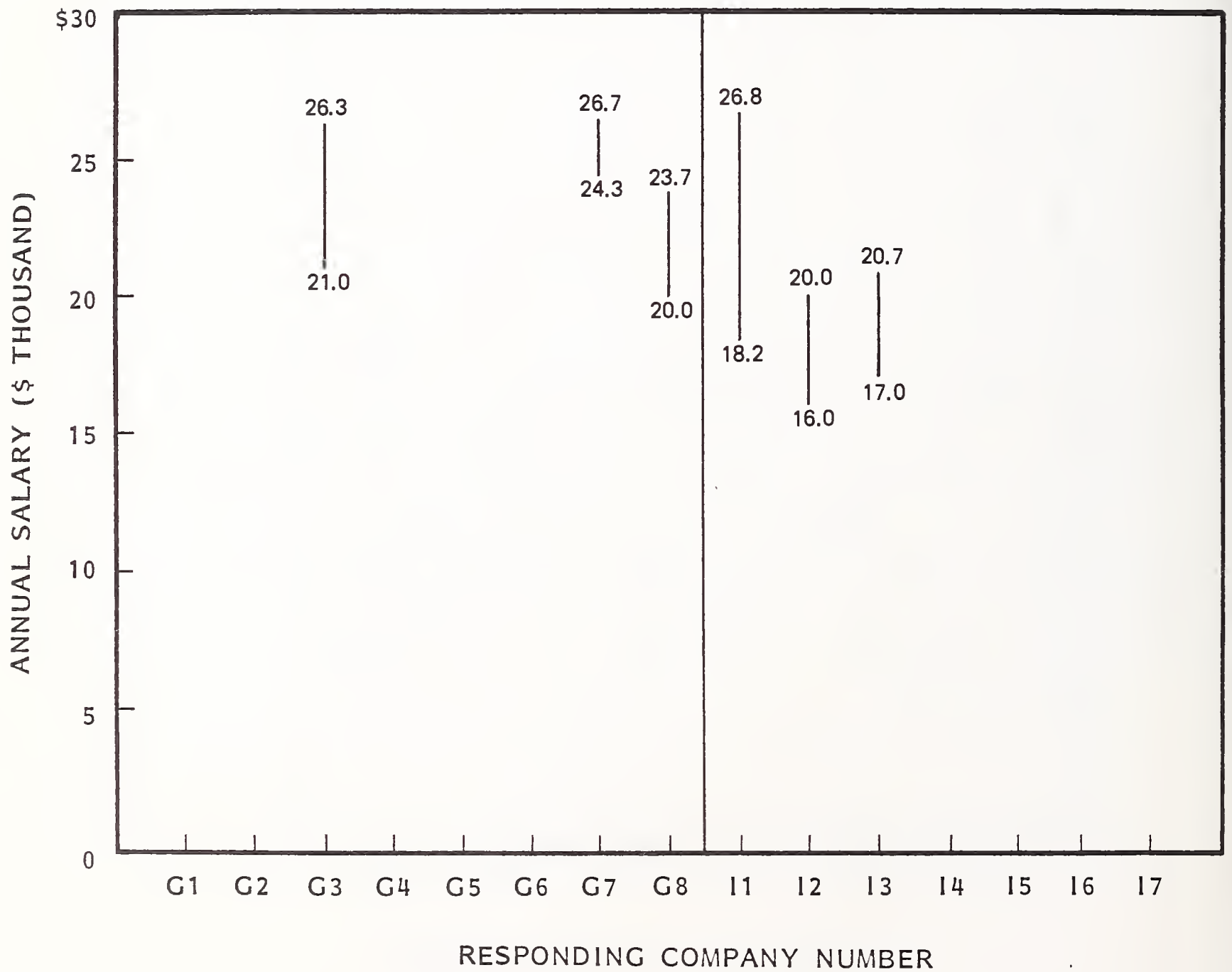
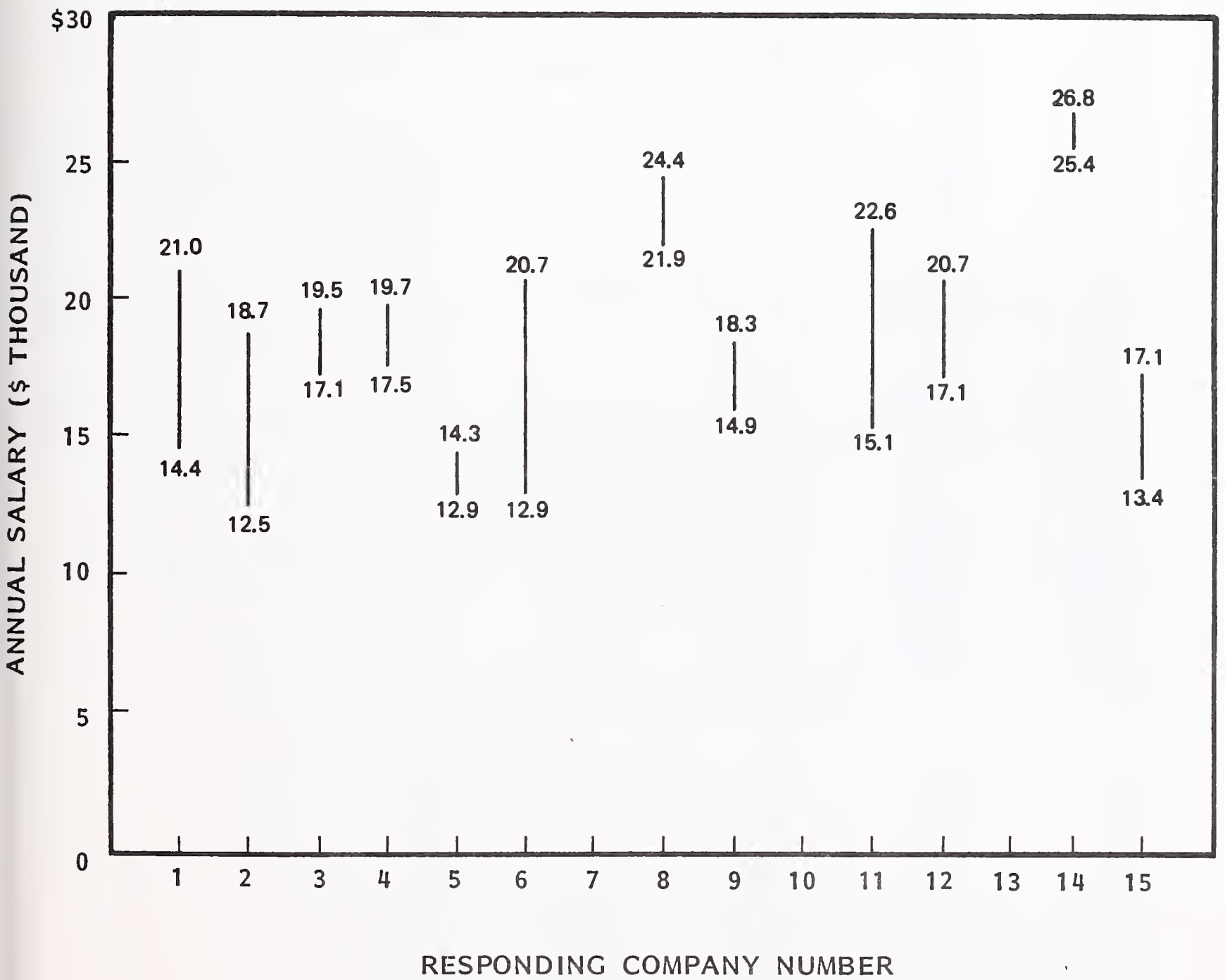


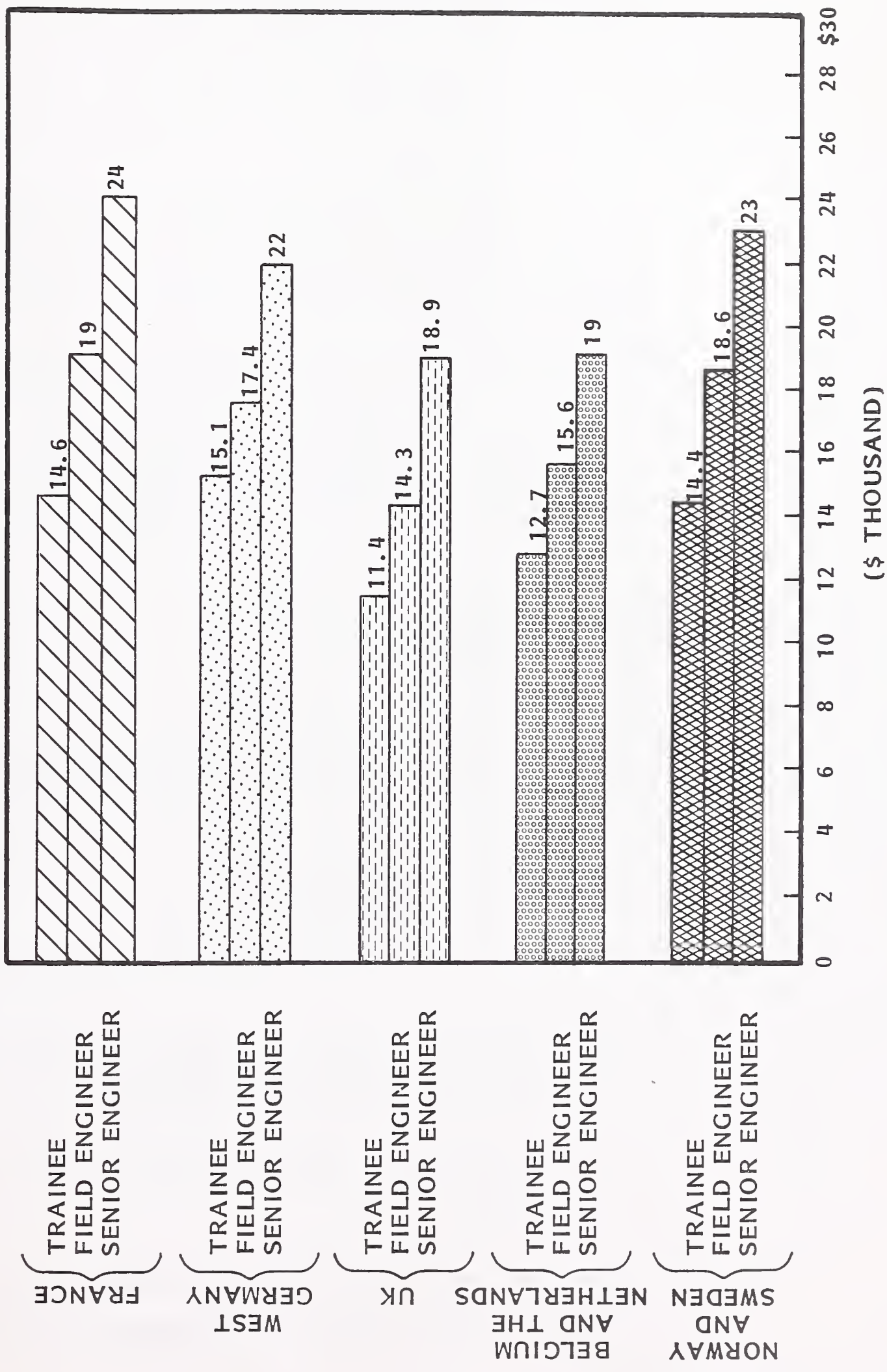
EXHIBIT V-16

ANNUAL SALARY OF AVERAGE SENIOR FE:
UNITED KINGDOM



- It was very worrying to find that the salary range from a trainee to a senior engineer was so compressed in many companies, as seen in Exhibit V-17. This allowed little income growth compared with growth in capability and responsibility. This encouraged the top engineers to change companies to improve their salary.
- Percentage increases reported by vendors indicate that often the salary adjustment did not cover inflation.
 - A higher percentage increase went to trainees and average FEs than to the higher-skilled senior FE, thereby closing the differential gap.
 - Predictions of future increases reverse this trend, but only by very small percentages.
- It appears that, although many vendors pay lip service to the fact that senior engineers are the 'creme de la creme', this is not reflected in salaries.
- These problems are compounded by the fact that field management salaries are often lower, grade for grade, than other similar positions in companies.
 - The primary reason for giving salary increases was inflation, but others included:
 - . Merit.
 - . Competitive situation.
 - . Market movement.
 - . Index linking.

VENDORS' AVERAGE FE SALARIES



- . Shortage of personnel.
- . Promotion.
- . Regrading.
- One interesting statement made by a major vendor was, 'I only know I have a salary problem when my best engineers leave, then it's too late'!
- Vendors must readdress the whole question of compensation.
 - Salary increases which are below inflation rates can only make the workforce more unstable and increase unrest among the field engineering force.

F. INCENTIVE PROGRAMMES

- Surprisingly, 13 respondent vendors (32%) stated that they had an incentive programme for FEs.
- The reported incentive schemes were:
 - 0.5% of billings per month.
 - On full service contracts, one month's revenue to the FE department for added compensation to the FEs involved.
 - Bonuses derived from growth plus profit, strongly biased towards local performance.
 - Bonus schemes based on call rates, defined as calls per system per monthly revenue, weighted by PM completion percentages.

- Productivity bonus based on sharing of savings arising from expense reductions, added value and actual costs against budget.
 - Bonus for every satisfactory service call completed over a basic 15 calls per week.
 - Profit sharing bonus by assisted stock purchase.
 - Monthly bonus based on achieving 99.5% prime availability.
 - Regular appraisal with performance discussed by both sides and a bonus relating to the year's performance agreed.
 - Based on service revenue from maintenance contracts, encouraging engineers to sell service.
 - Prizes for top engineers reaching their pre-specified objectives.
 - In Italy, some FE staff get one-quarter of their yearly income as a bonus for meeting pre-defined objectives: 'All our FE managers (worldwide) have incentive plans amounting to 10% of salary, mainly linked to profit objectives'.
- Incentive or bonus schemes appear effective in motivating and rewarding engineers, provided the scheme is objective, fair and not at the whim of a manager.
 - INPUT, in discussions with numerous engineers, has found that many would prefer increases in company status and shorter working hours to nominal pay raises.

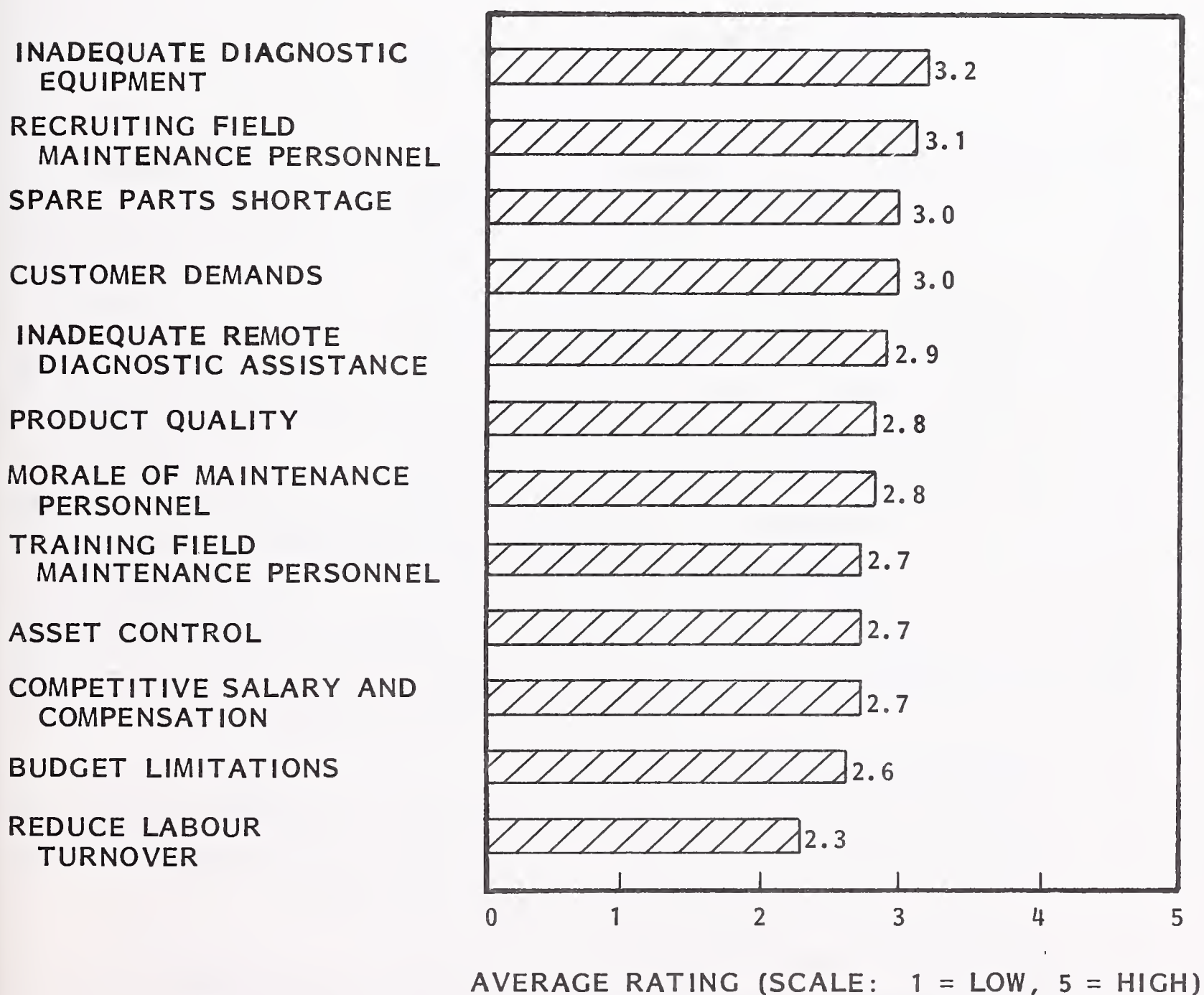
- Many engineers expressed their concern that the field engineering workforce was often below budgetted levels and the extra work burden was falling on the man in the field. To quote one engineer, 'I never have time to spend all the overtime I earn'.
- Another hard-pressed engineer quoted, 'My family is growing up and I am missing the enjoyment of my children'.
- One other complaint voiced by an engineer was that his wife, although expecting to suffer his long hours, call outs in the night, etc., gets no recognition from his company.

G. VENDOR RATINGS OF PROBLEMS AND CHALLENGES

- Exhibit V-18 shows that vendors list the inadequacy of diagnostic equipment as their severest problem.
- This was followed by the problems of recruiting engineers, and reducing turnover was rated lowest. Obviously, a greater concern with turnover and with means of reducing turnover would have a beneficial impact on recruiting by reducing the number of new hires required.
- Mainframe and terminal vendors expressed a higher level of concern for remote diagnostics than did small business and mini vendors.
- Surprisingly, in this period of inflation and a turndown in the overall economy of Europe, budget limitations were of low concern.

EXHIBIT V-18

VENDORS' RATINGS OF PROBLEMS
RELATED TO FIELD SERVICE

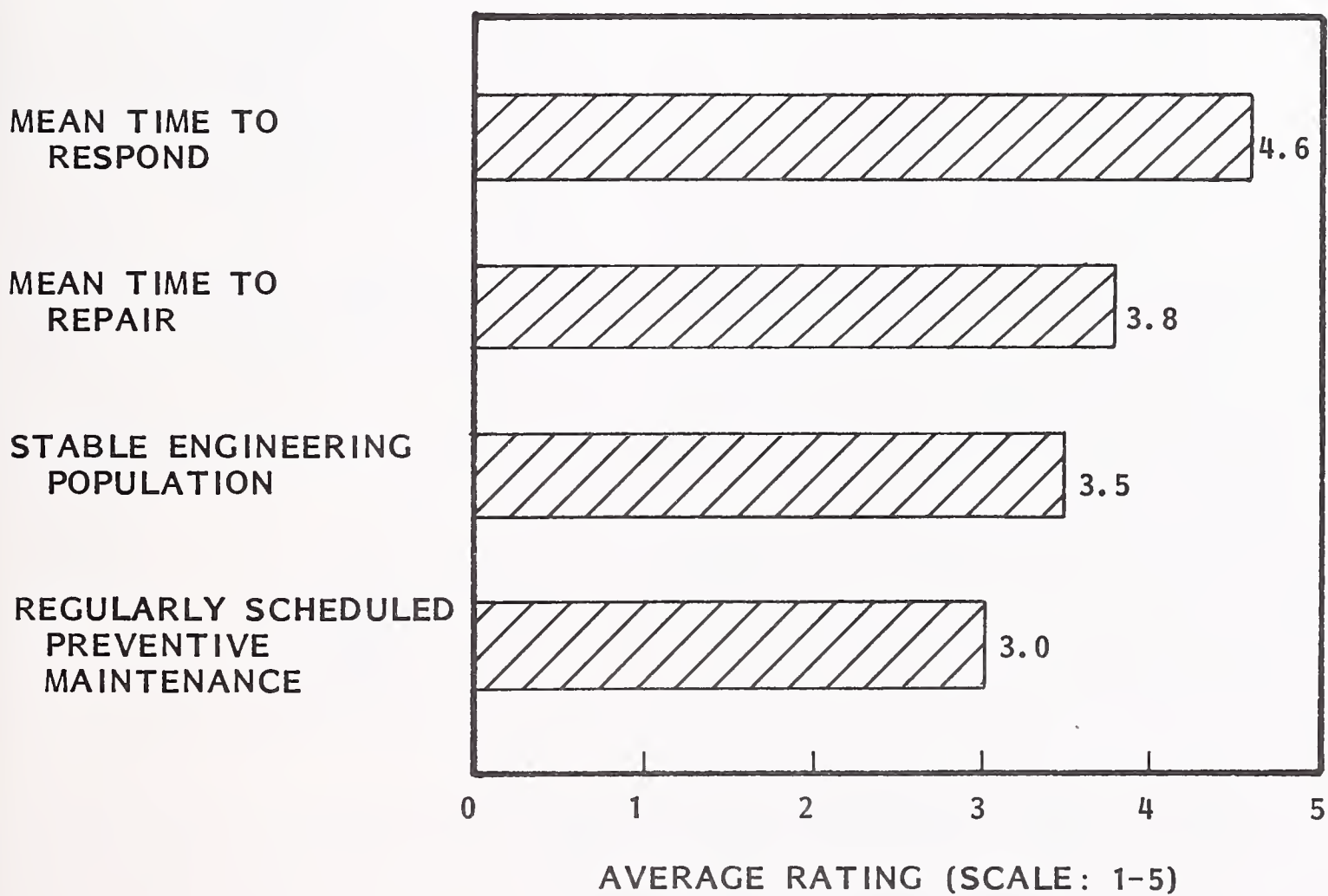


H. VENDORS' PERCEPTIONS OF MAINTENANCE

- Exhibit V-19 contains the data showing the vendors' perception of the importance of various field service characteristics.
- Mean time to respond was rated highest by the vendors.
 - This is in response to the current market pressure.
 - Vendors are becoming aware that response is the prime measure as applied by the user.
 - One vendor admitted that he had lost a \$2 million terminal contract because he had underestimated the importance the user was placing on response time.
- Mean time to repair was placed in second position, closely followed by the need for a stable engineering population.
 - A number of vendors reported that users still over-reacted to changes in organisation or in the prime engineer interfacing with the user.
 - To quote one vendor, 'I changed the engineer in charge at the site in response to a complaint about quality - the user went crazy and was only pacified by the return of the engineer in question'.
- With the advent of more reliable and improved hardware, the need for preventive maintenance is falling. However, for as long as there are moving parts, predominantly in I/O devices, the need will continue.
- Two vendors, in previous discussions with INPUT staff, expressed concern at the users' sometimes fanatical demand for regular preventive maintenance.

EXHIBIT V-19

VENDORS' PERCEPTIONS OF
FIELD MAINTENANCE CHARACTERISTICS



- If field service organisations plan a reduction in preventive maintenance, it has to be carefully sold to the traditional user.
- Generally, it seems vendors have failed to make the users aware of the greater use of on-line testing, which allows far better anticipation of possible trouble areas and less need for PM.

I. VENDORS' RESPONSE AND REPAIR TIMES

- Individual vendors reported a wide range of equipment availability, from as low as 80% to as high as 99% equipment uptime. However, the average uptime for equipment, as shown in Exhibit V-20, was within a narrow range.
 - Medium to large mainframe vendors averaged 97.1%, while small business computer suppliers reported a slightly lower 96.5%.
 - Peripheral equipment vendors reported an average availability of 96.5%.
 - Minicomputer vendors fared a little worse, at 95.2%.
 - Terminal vendors had the lowest availability, averaging 93.4%.
- Data collected on mean time between failures (MTBF) are also included in Exhibit V-20. Terminals, despite their high electromechanical content, were reported to have a MTBF almost three times greater than that for the other equipment categories. There were no significant differences on a country-to-country basis.
 - MTBF on mainframes had the widest variation, ranging from a reported MTBF of 300 hours to 2,080 hours.

VENDORS' RESPONSES TO
EQUIPMENT AVAILABILITY

EQUIPMENT TYPE	AVERAGE UPTIME		MTBF		AVERAGE REPAIR TIME		AVERAGE RESPONSE TIME	
	RESPON- DENTS	PERCENT	RESPON- DENTS	HOURS	RESPON- DENTS	HOURS	RESPON- DENTS	HOURS
MAINFRAMES	14	97.1%	8	1,110	14	3.2	14	2.9
SMALL BUSINESS MACHINES	15	96.5	11	1,474	17	3.1	17	4.3
MINICOMPUTERS	111	95.2	10	1,340	11	2.4	11	4.8
PERIPHERALS	12	96.5	10	1,360	10	1.75	16	5.1
TERMINALS	15	93.4	13	3,134	14	1.4	12	8.6

- Small business machines were somewhat disappointing in achieved reliability. It was expected that these would exceed 2,000 hours, as vendors used the experience and knowledge gained from the forerunner - the minicomputer.
- . It was encouraging that, despite this shortfall in MTBF, the availability was 96.5%, reflecting a faster turnaround than had been achieved in the minicomputer market.

J. VENDORS' RESPONSES ON ENGINEERING CHANGES

- The average field engineer working in Western Europe spends 6.5% of his time installing engineering changes (ECN).
- Two companies reported they had no clear idea of the exact times spent on ECNs.
 - One quoted, 'No figures are available but the time spent must be low, well, I think it is!'
 - One vendor reported that currently over 18% of his engineer's time was spent on ECNs because of 'unexpected technical problems caused by a design error coupled with a bad batch of chips'.
 - This vendor was very concerned as to how he was going to recover the costs and maintain a credible service.
- General comments from vendors in regard to ECNs included:
 - 'Includes upgrading of equipment due to software changes.'

- 'Very low due to product specification being stable for the past three years.'
 - 'Low due to excessive backlog building up!'
 - 'A rare occurrence.'
 - 'Most ECNs are phased in at subassembly level during repair cycle.'
 - 'It's high, well, it's a new product.'
 - 'Being a third-party operation we don't do much, mainly because we do not have enough information.'
- One vendor reported no time spent on ECNs with the comment 'no programme exists'.
 - Four vendors reported that the backlog of ECNs was a very real concern and that in two of these cases a concentrated effort was planned to reduce this backlog.
 - The best time to implement ECNs is not universally agreed upon.
 - It is commonly done during preventive maintenance periods.
 - Vendors are reluctant to ask users for prime time to install changes.
 - Engineering managers are often defensive about ECNs. While many users would accept the explanation of improved performance and reliability, more had the attitude that it was a fix for a problem the vendor should have found in the preproduction model.

K. REPEAT CALLS

- The number of repeat calls averaged 10.6%.
- German vendors reported the lowest percentage of calls that had no fault found at 6%.
- Vendors reported that calls repeated within two weeks ranged from 2% up to 20%.
- Nineteen of the responding 41 vendors reported a repeat call rate of less than 10%.
- The average number of trouble calls that had no fault found was 8.9%, with the U.K. having the highest (10.7%).
- With the reported loss of productive effort spent on repeat and 'no fault found' calls, an opportunity exists for significant improvements in the utilisation of an FE's time.

L. ENGINEER REPAIR ACTIVITY

- All responding vendors reported that their engineers replaced boards on-site to effect repairs and that they will continue this practice through 1984.
- Four of these vendors expected their engineers to attempt to repair the board on-site. Vendors predicted a shift in the number expecting FEs to replace components.
 - Only three vendors reported that, by 1984, they would still expect FEs to replace components.

- This shift continues the current de-skilling of the FE to the level of board swapper.
- This also will enable software engineers to carry out many of the tasks currently performed by the hardware FE.
- One vendor reported that he now has a definite policy of cross-training his software people to undertake many of the tasks normally performed by the traditional field engineer.
 - This allows the software engineer greater job opportunity and job satisfaction, while allowing the vendor better utilisation of engineers' time.
 - Unfortunately, this vendor stated that only 10% of his FEs were being retrained on software.

M. MAINTENANCE SUPPORT

- Of the 41 responding vendors, 44% used support engineers from the U.S., the reasons stated being:
 - 'We are a U.S. company.'
 - 'The main manufacturing plant is in the U.S.'
 - 'Only for very difficult problems.'
 - 'Exceptional.'
 - 'Ultimate support (top level).'

- 'Not too often as it costs so much.'
- 'Builds confidence with customer.'
- Over 56% of the responding vendors stated that they used support from other European countries, usually because where a European headquarters exists, so does a central technical support function. Other comments were:
 - 'Helps with installations.'
 - 'Interchange with other operating companies.'
 - 'Only for telecommunications.'
 - 'From our manufacturing plant in France.'
 - 'From our parent company in Germany.'

N. TRAINING OF FIELD ENGINEERS

- The training of FEs in the U.S. is still a very significant part of many organisations' budgets.
 - An average of 23% of the vendors' training is carried out in the U.S.
 - The totally European vendors sent FEs to the U.S. only for very specialised subjects such as personnel leadership courses or very technical training.
- An average of 41.3% of the training by the responding vendors was carried out in another European country. Three vendors report having Europe training centres responsible for all training within Europe.

- Only 39% of the responding vendors reported a defined management training programme for engineers. Comments included:
 - 'A human relationship course with personnel leadership and motivation.'
 - 'Only senior engineers get management training.'
 - 'All new engineers have a customer relations and corporate objectives course.'
 - 'Only self-teaching with video and cassettes.'
 - 'We use specialised outside courses.'
 - 'Full-training facilities in-house allow progressive levels of training.'
 - 'Management training is tailored to suit current requirements and situations.'

O. FORMAL ESCALATION PROCEDURES

- Only five of the 41 vendors returning the questionnaire did not have a formal escalation procedure. Reasons given were:
 - 'All installations have a manager responsible for them.'
 - 'All trouble calls in each country are handled by a central dispatch centre and so management can easily find out what's happening.'
 - 'If the engineer needs help, he must ask for it.'
 - 'We employ responsible engineers.'

- The other 36 vendors reported having a formal escalation procedure.
- When asked what percentage of a vendor's clients know of these escalation procedures, the responses ranged from 0-100%.
- The following comments reflect attitudes about involving and informing the user:
 - 'Of importance only to large and experienced users.'
 - 'Very important to large accounts.'
 - 'We don't propagate the procedure, as the customer would overrule local management.'
 - 'Very important; IBM does it, don't they?'
 - 'Word processing users are not so demanding, so we don't tell them.'
 - 'Customers feel looked after.'
 - 'If you tell the customer, you lose control.'
 - 'Only important to real users.'
 - 'It's better if we don't tell the customer as we never follow the procedure.'
 - 'Shows we are for our customers.'
 - 'The customer calls me anyway.'
- Responding vendors rated the importance of escalation procedures highly, with an average of 4.2 on a scale of 1 to 5.

P. VENDORS' RESPONSE ON SPARES INVENTORY

- With rising interest rates and increasing operating costs vendors have become far more concerned with the cost of carrying spares inventories. These carrying costs may go as high as 42% of the basic spares cost on an annual basis.
- One major vendor reported that he had a very successful programme in asset reduction.
 - This was accomplished by forming an asset reduction team, which then sets reduction objectives.
 - These teams were formed on a country-by-country basis, each country competing against the other for a top rating in asset reduction.
 - The team which at year end accomplished the greatest reduction was invited to the annual 100% sales meeting.
 - The whole programme proved very successful, reducing assets by as much as 23%.
- Another company reported that they could justify a man full time travelling around Europe checking stock. His return to the warehouse was like the arrival of 'Father Christmas'; it was amazing what the field engineers hoarded!
- Twenty-one of the respondents had some form of asset reduction programme, the success of which averaged 3.1 on a scale of 1 to 5.
- One vendor stated that INPUT's asking the question had prompted him into action and that he was now introducing such a programme.

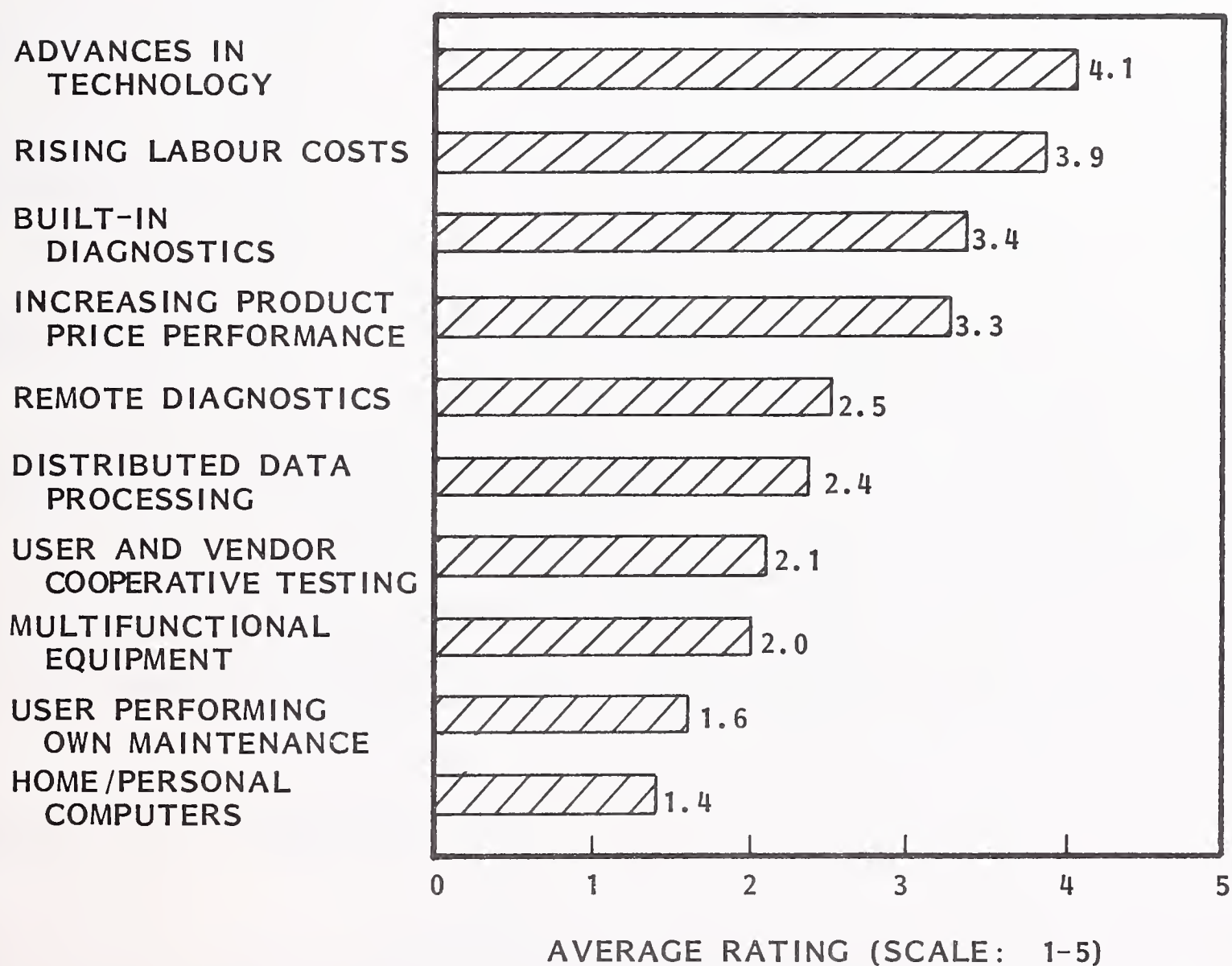
- Only two of the vendors stated that customers held their own spares. Reasons for this were:
 - Customers had lost confidence in distribution and availability of parts.
 - Some customers have their own R&D and do their own basic maintenance.

Q. THE IMPACT OF MAJOR FACTORS RELATING TO MAINTENANCE TECHNIQUES

- The advances in technology are having the greatest impact on the ever changing maintenance scene. According to 81% of respondent vendors, this was the prime concern, as shown in Exhibit V-21.
- This was very closely followed by the impact of rising labour costs, which were rated at 4 or above, on a scale of 1 to 5, by 75% of responding vendors.
- More exotic solutions such as automated remote diagnostics are being implemented to reduce labour costs. The high setup costs of these endeavours must be amortised against predicted labour savings. Often these labour estimates are overly optimistic.
- In the past, reduced response times and customer satisfaction have been solved by overmanning.
 - The high idle time of engineers is justified by such statements as, 'Well, that's our kind of business'.
 - Many field engineers are notorious for their inaccurate time sheets.

EXHIBIT V-21

VENDORS' RESPONSES ON THE IMPACT OF FACTORS RELEVANT TO MAINTENANCE TECHNIQUES



- There are often guilty feelings about reporting idle or non-productive time.
- A major vendor employing over 500 engineers told INPUT that by introducing a 'real' element into reporting, he was coming to grips with the problem; he estimated that he may be overstaffed by 25%. Armed with such information, he is able to contain the demand for more engineers associated with additional business.
- Of medium impact was the question of increasing product price/performance ratios.
 - As maintenance costs become much more visible to the user, pressure will increase to reduce rates.
 - As the pressure increases to sell maintenance, so will the need to sell by justification, such as price/performance.
- The continuing use and new introductions of built-in diagnostics were rated the third most important area impacting field maintenance.
 - With the falling cost of hardware and the dispersal of products, it is very cost effective to have a built-in diagnostic aid accessible by low-level engineers.
 - In the U.S., IBM is using this facility to the fullest in the 3100 display terminal.
 - By designing an effective and simple diagnostic aid, the need for an engineer is completely removed.

- A failed unit is diagnosed by the user using the built-in diagnostics. These identify which of the assemblies (screen, keyboard or control box) has failed. The user then takes the unit to his local maintenance depot for repair.
- In Europe, the impact of the user performing his own maintenance is rated in last place.
 - This does not rule out the fact that most vendors now expect the user to do little more than just report his system down.
 - Users are happy to help in prequalifying faults, as they appreciate that this results in faster response.
- The impact of remote diagnostics and distributed processing on maintenance techniques is rated as only moderate.
 - Vendors with an effective remote diagnostic system rated this much higher than those without.
- Seventy percent of the vendors gave a very low rating of the impact of personal and home computers.
- The impact of other techniques was rated highly by six other respondents. The other techniques were:
 - Skill scarcity.
 - Repairs at a high level; engineers changing subassemblies or PCBs rather than identifying the failed component.
 - Real-time processing.
 - Improvements in reliability.

- New markets for products.
- Board testers.
- Only 15% of the vendors did not have a local repair facility.
 - The level of repair carried out by the remaining 85% varied. Specialised repair work such as power supplies, tape heads and voice coil units would often be subcontracted out to a local small engineering workshop.

R. RESEARCH AND DEVELOPMENT

- Only six vendors reported spending any of their operating budget on improvements to maintenance techniques.
 - No one spent more than 5%; the average was only 2.75%.
 - The majority of vendors act as unpaid consultants to their manufacturing and development units.
- Those reporting no R&D expenditure made such comments as:
 - 'Indirect via technical support reports.'
 - 'Technical manager is consulted through design stages.'
 - 'We (FE) must approve all new products.'
 - 'Advises on senior capability aspects.'
 - 'FE organisation represented in evaluation of new design.'

- 'Involved in the test phase of new product.'

S. MAINTENANCE PRICING

- Incredibly, 25% of the responding vendors have not increased their prices during the past year.
- The other 75% had increased maintenance charges ranging from 3-25%. The average in Western Europe was 8.7%:

- West Germany	11.0%
- France	8.0
- United Kingdom	12.3
- Belgium and the Netherlands	5.3
- Norway and Sweden	8.0
- Multinational	7.6
- The prime reason given for these increases was inflation, although very few U.K. companies increased their charges by the same amount as the national inflation rate.
- Labour costs were also quoted in most cases as being a cause for the increase.
- Only five of the responding vendors stated competitors' prices as being a factor. One third-party operation stated that this was the limiting factor.

- The predicted 1981 price rise will average 12.1% in Europe:

- West Germany	15.5%
- France	10.0
- United Kingdom	13.7
- Belgium and the Netherlands	7.7
- Norway and Sweden	13.5
- Multinational	12.2

- Inflation remains the driving force in 1981, with 26 mentions, followed by labour costs, with 25 mentions.

- Parts costs have eight mentions, while competitors' pricing is only considered a serious influence by five vendors, one of these again stating it was the limiting factor.

- One vendor quoted high allocations from corporate headquarters as the significant factor.

APPENDIX A: DEFINITIONS

APPENDIX A: DEFINITIONS

- DISTRIBUTED DATA PROCESSING - Distributed processing is the deployment of programmable intelligence in order to perform data processing functions where they can be accomplished most effectively, through the electronic interconnection of computers and terminals, arranged in a telecommunications network adapted to the user's characteristics.
- DISTRIBUTOR - Purchases the small business computer on an OEM basis from the manufacturer and markets it to the end user. It may or may not provide a turnkey system.
- END USER - May buy a system from the hardware supplier(s) and do his own programming, interfacing and installation. Alternatively, he may buy a turnkey system from a systems house or hardware integrator.
- ENGINEERING CHANGE NOTICE (ECN) - Product changes to improve the product after it has been released to production.
- ENGINEERING CHANGE ORDER (ECO) - The follow-up to ECNs, which includes parts and a bill of materials to effect the change in hardware.
- FIELD ENGINEER (FE) - For the purposes of this study, field engineer, customer engineer, serviceperson and maintenance person were used interchangeably and refer to the individual who responds to a user's service call to repair a device or system.

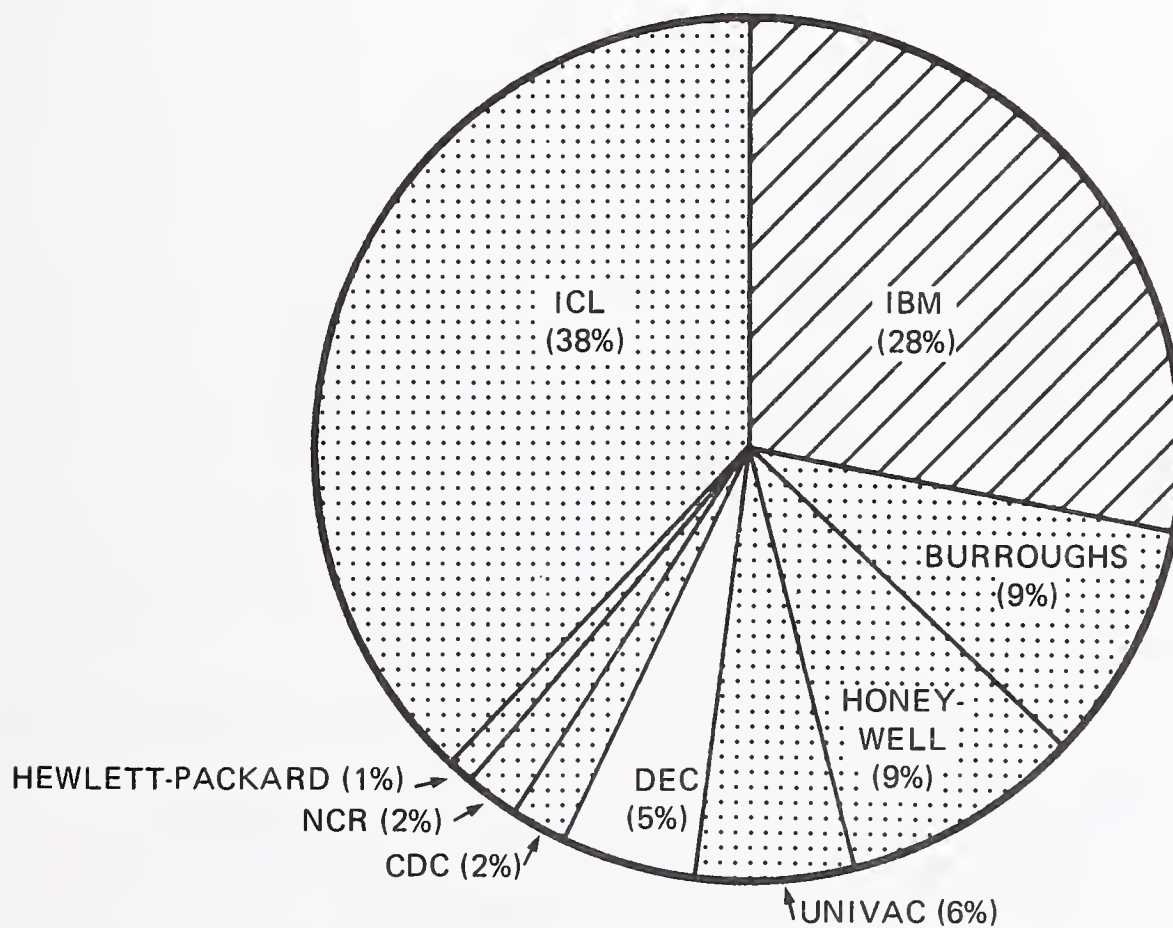
- HARDWARE INTEGRATOR - Develops system interface electronics and controllers for the CPU, sensors, peripherals and all other ancillary hardware components. He may also develop control systems software in addition to installing the entire system at the end user's site.
- MEAN TIME BETWEEN FAILURE (MTBF) - The elapsed time between hardware failures on a device or a system.
- MEAN TIME TO REPAIR - The elapsed time from the arrival of the field engineer on the user's site until the device is repaired and returned to the user for his utilisation.
- MEAN TIME TO RESPOND - The elapsed time between the user's placement of a service call and the arrival of a field engineer at the user's location.
- PERIPHERALS - Include all input, output and storage devices, other than main memory, which are locally connected to the main processor and are not generally included in other categories, such as terminals.
- SMALL BUSINESS COMPUTER - For the purposes of this study, is a system which is built around a Central Processing Unit (CPU), has the ability to utilise at least 20M bytes of disc capacity, provides multiple CRT workstations and offers business-orientated systems software support.
- SOFTWARE PRODUCTS - Systems and applications packages, which are sold to computer users by equipment manufacturers, independent vendors and others. Also included are fees for work performed by the vendor to implement a package at the user's site.
- SYSTEMS HOUSE - Integrates hardware and software into a total turnkey system to satisfy the data processing requirements of the end user. It may also develop systems software products for license to end users.




- TURNKEY SYSTEM - Composed of hardware and software integrated into a total system designed to completely fulfill the processing requirements of a single application.

**APPENDIX B: SUPPORTING CHARTS ON
INTERVIEW SAMPLE**

EXHIBIT B-1

RESPONDENTS' MAINFRAME MAINTENANCE VENDORS: UNITED KINGDOM

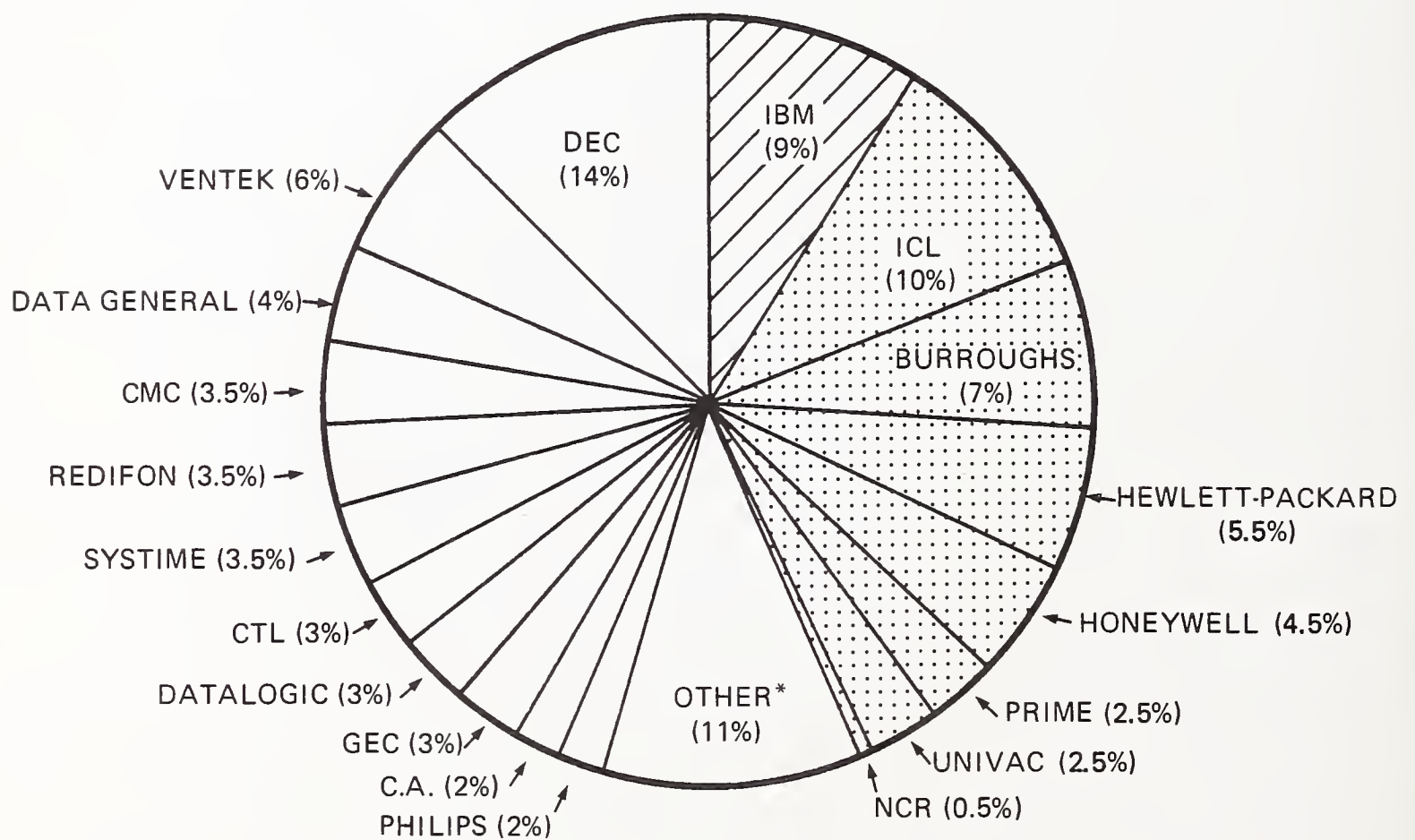



-  IBM (28%)
-  OTHER MAINFRAME (67%)
-  NON-MAINFRAME (5%)

N.B.: DEC VIEWED BY SOME RESPONDENTS AS A MAINFRAME VENDOR

EXHIBIT B-2

RESPONDENTS' SMALL BUSINESS SYSTEM AND MINICOMPUTER MAINTENANCE VENDORS: UNITED KINGDOM

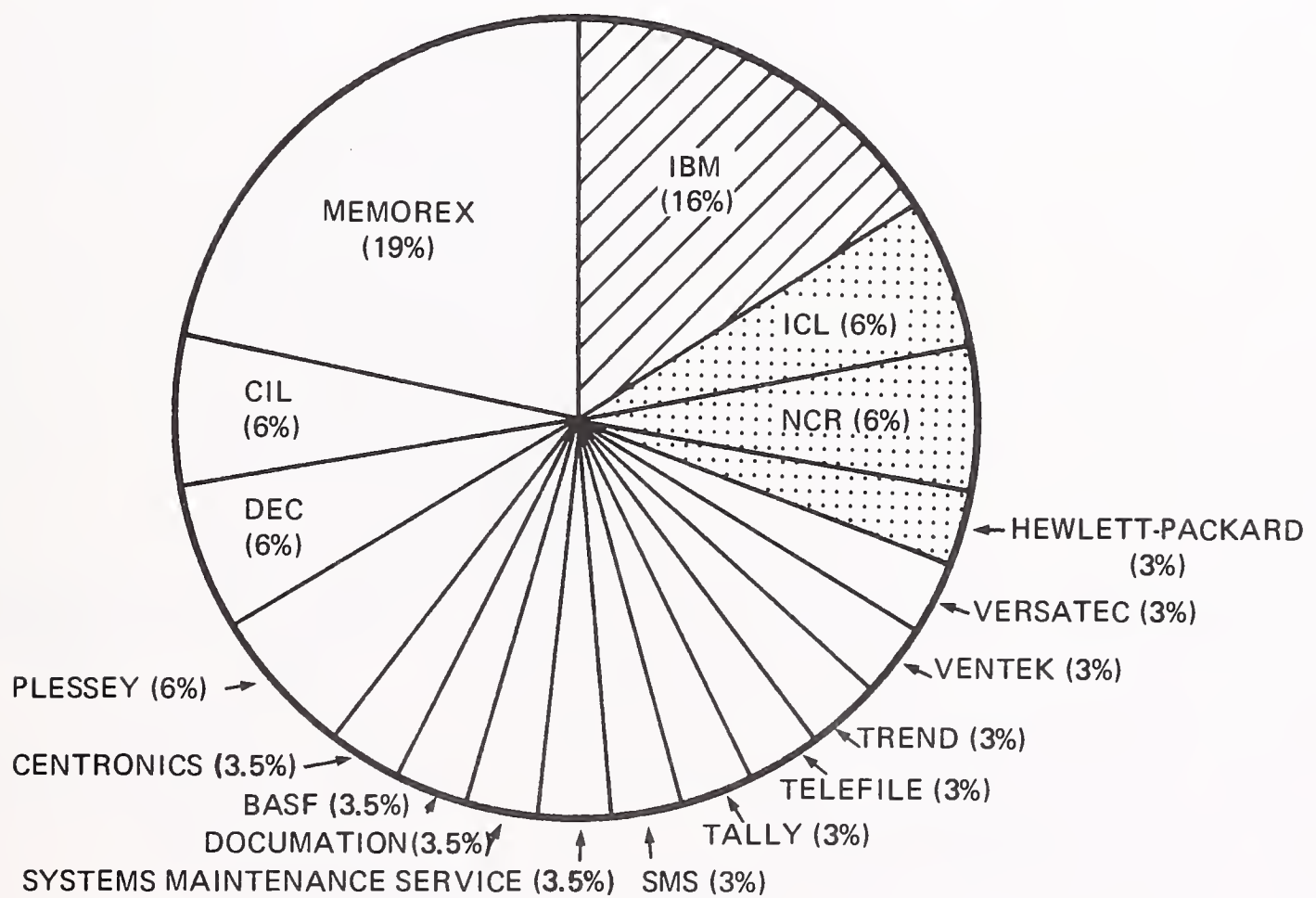


-  IBM (9%)
-  OTHER MAINFRAME (32.5%)
-  NON-MAINFRAME (58.5%)

*SINGLE MENTIONS EACH OF: CARA, DACOLL, KIENZLE, KODE, ADLER, MCS, OLIVETTI, PLESSEY, RACAL, RAIR, TANDY, TEXAS INSTRUMENTS

EXHIBIT B-3

RESPONDENTS' PLUG COMPATIBLE PERIPHERAL MAINTENANCE VENDORS: UNITED KINGDOM






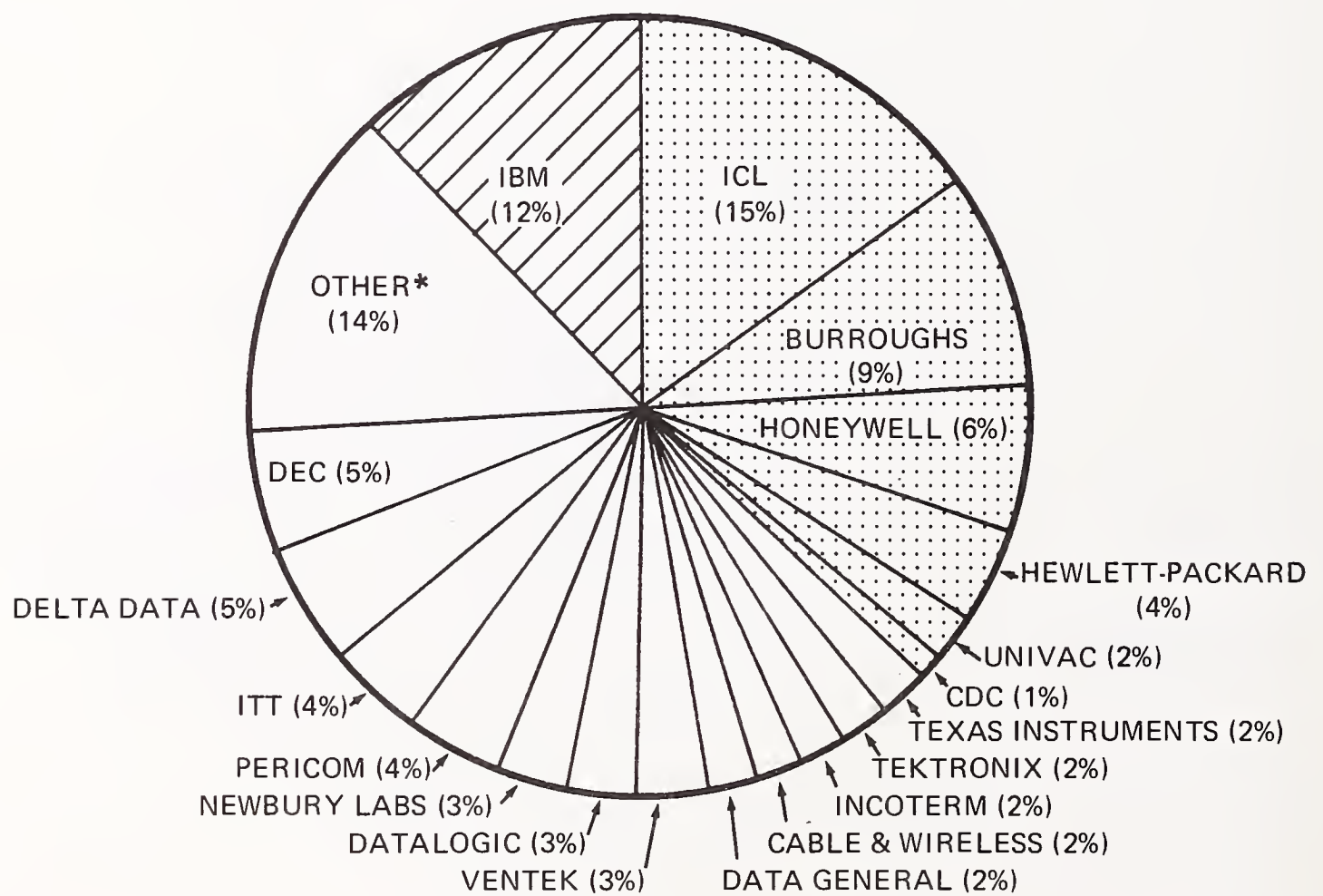



-  IBM (16%)
-  OTHER MAINFRAME (15%)
-  NON-MAINFRAME (69%)

EXHIBIT B-4

RESPONDENTS' TERMINAL MAINTENANCE VENDORS: UNITED KINGDOM

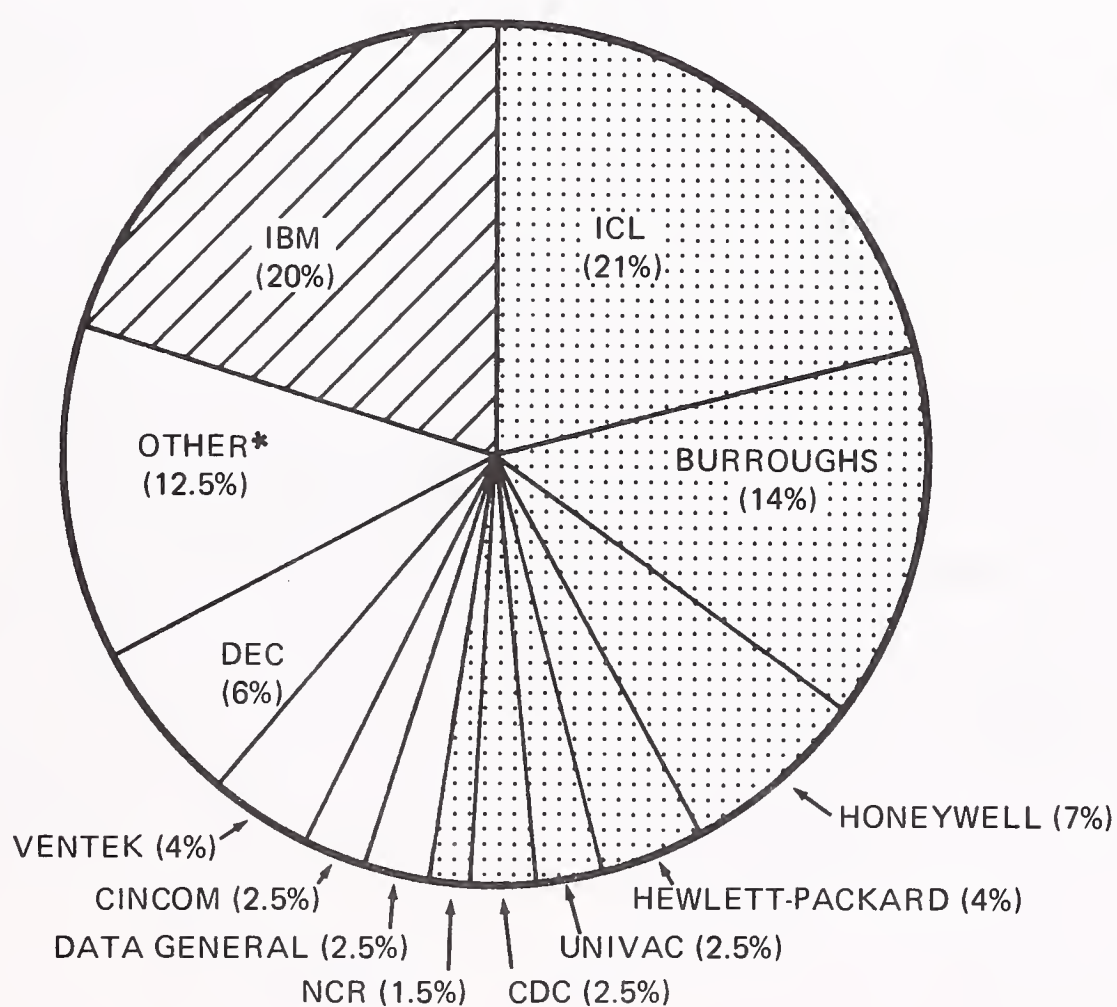





-  IBM (12%)
-  OTHER MAINFRAME (37%)
-  NON-MAINFRAME (51%)

* INCLUDES SINGLE MENTIONS EACH OF: DACOLL, FORTRONICS, HARRIS, HAZELTINE, LEAR SIEGLER, LOGABAX, LYNWOOD, MDS, NCR, OLIVETTI, RACAL MILGO, REDIFON, SYSTIME, WESTREX

EXHIBIT B-5

RESPONDENTS' SYSTEMS SOFTWARE MAINTENANCE VENDORS: UNITED KINGDOM



-  IBM (20%)
-  OTHER MAINFRAME (52.5%)
-  NON-MAINFRAME (27.5%)

*INCLUDES SINGLE MENTIONS EACH OF: CEI CYNCOM, DATASKIL, LP COMPUTING SERVICES, SAFE, SDI, SOFTWARE AG, SYSTIME, TELECOMPUTING, WESTINGHOUSE

EXHIBIT B-6

RESPONDENTS' APPLICATIONS SOFTWARE MAINTENANCE VENDORS: UNITED KINGDOM

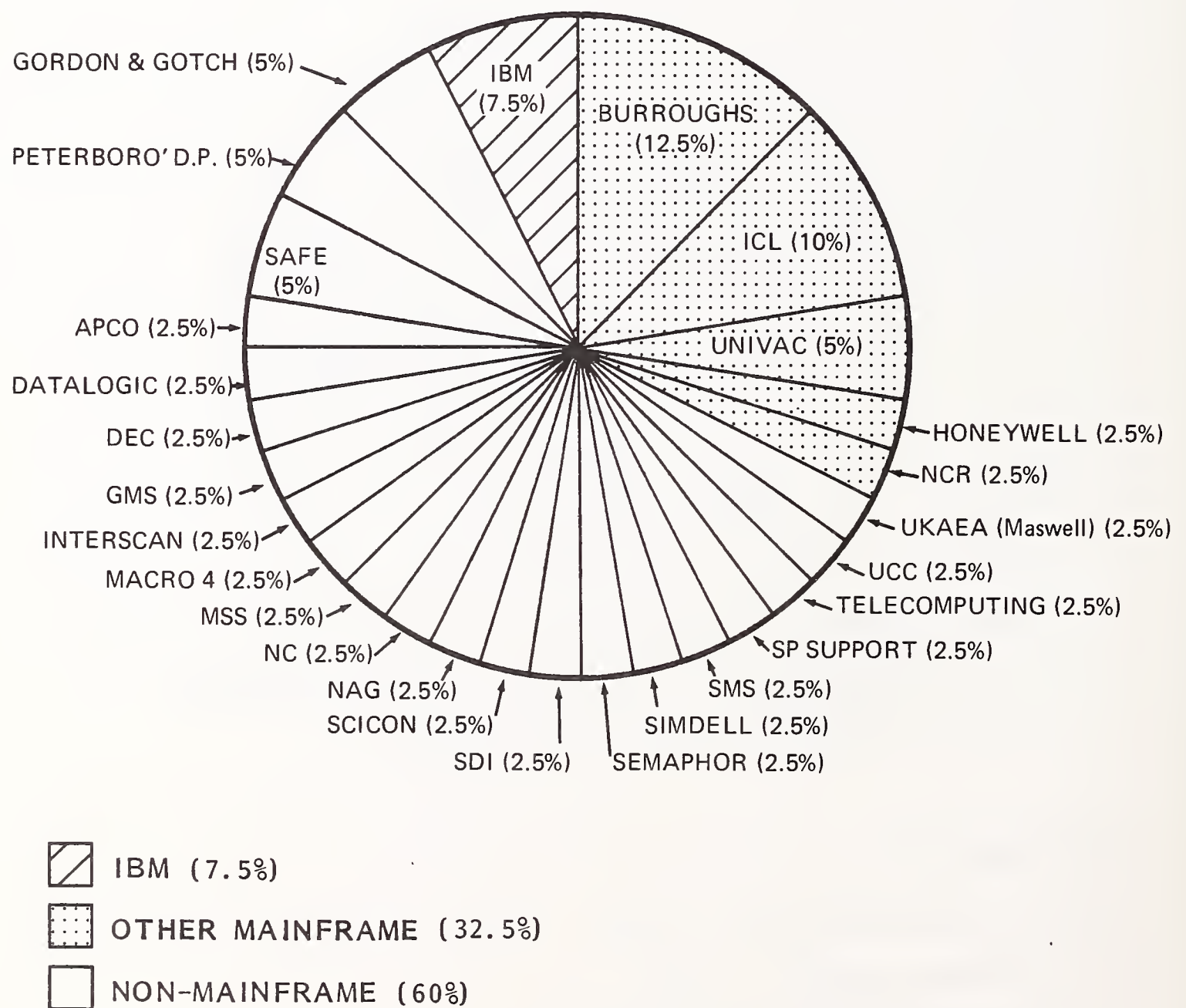
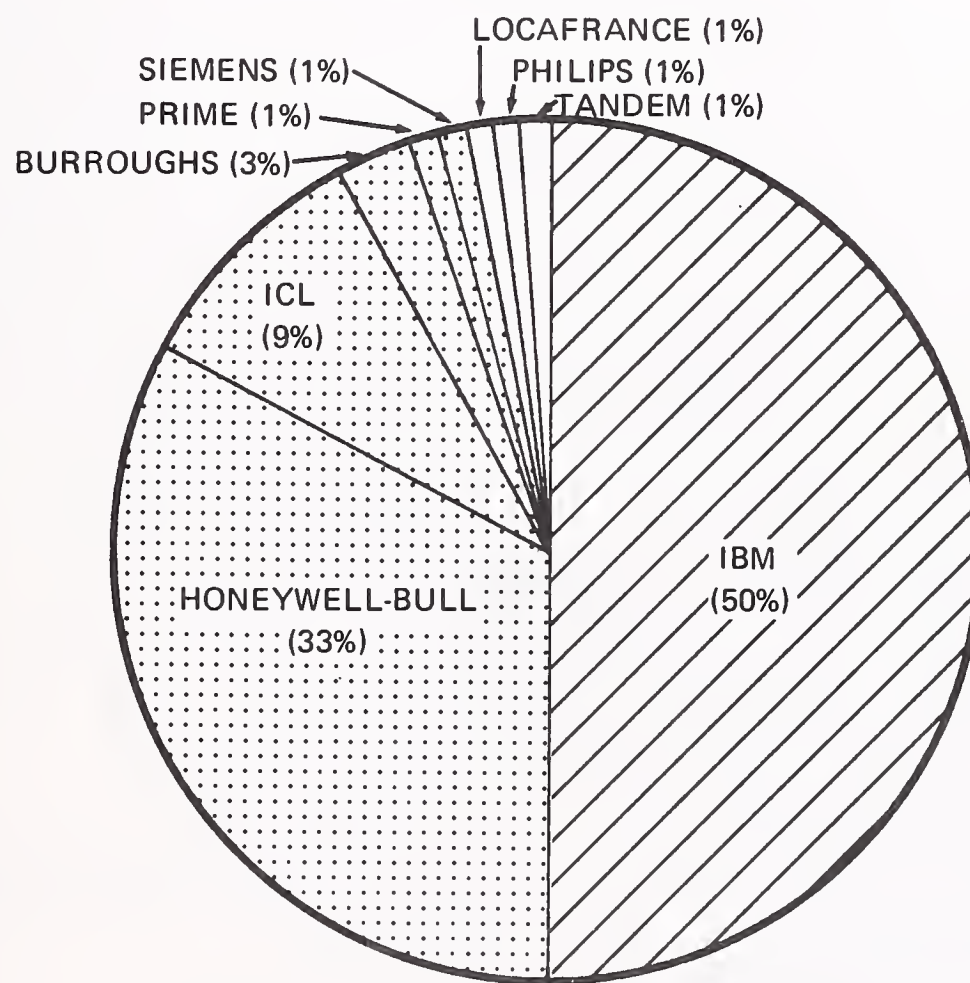


EXHIBIT B-7

RESPONDENTS' MAINFRAME MAINTENANCE VENDORS:
FRANCE

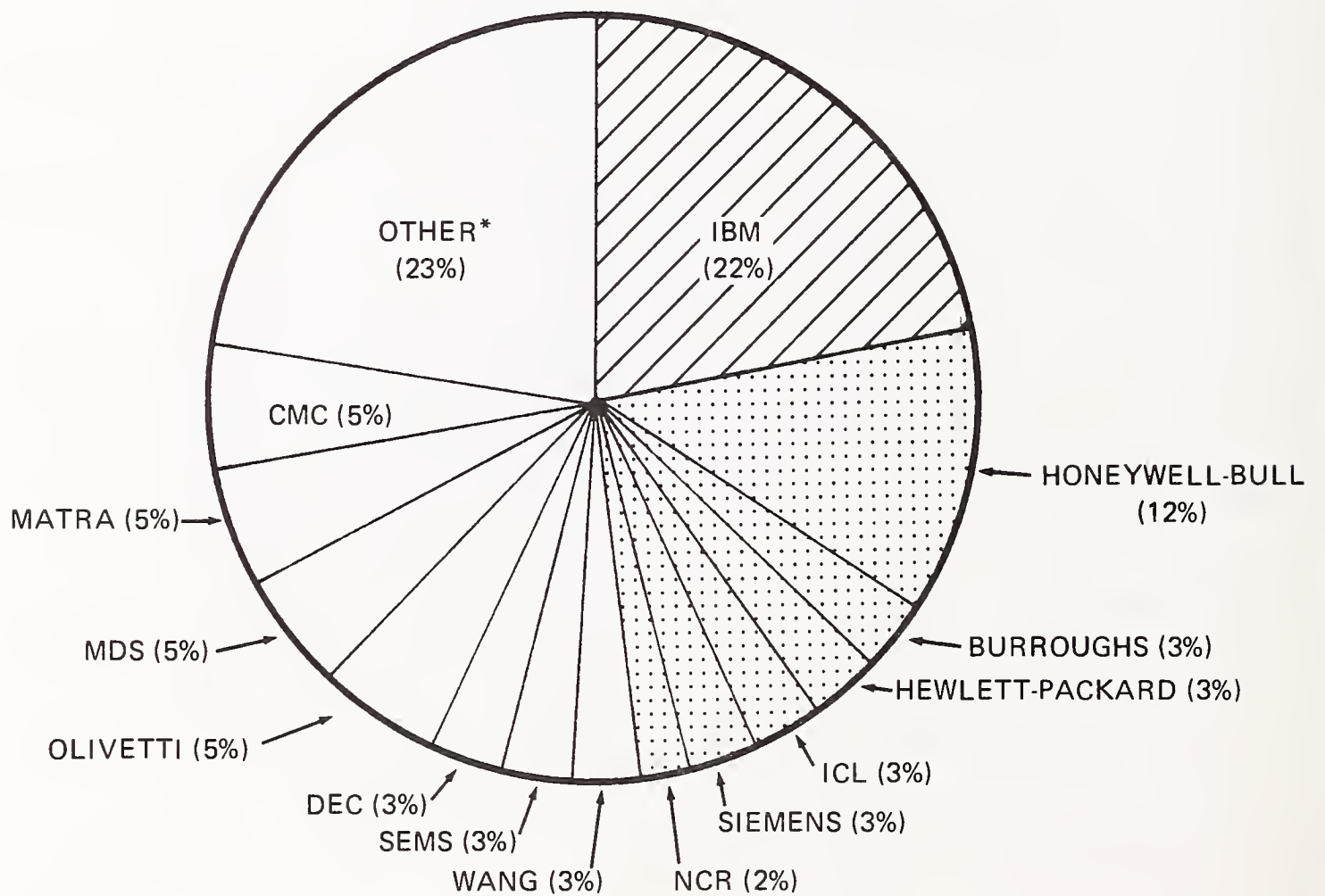





- ☒ IBM (50%)
- ☒ OTHER MAINFRAME (47%)
- ☐ NON-MAINFRAME (3%)

N.B.: LOCAFRANCE, PHILIPS AND TANDEM ARE PERCEIVED BY SOME RESPONDENTS AS MAINFRAME VENDORS.

EXHIBIT B-8

RESPONDENTS' SMALL BUSINESS SYSTEM AND MINICOMPUTER MAINTENANCE VENDORS: FRANCE

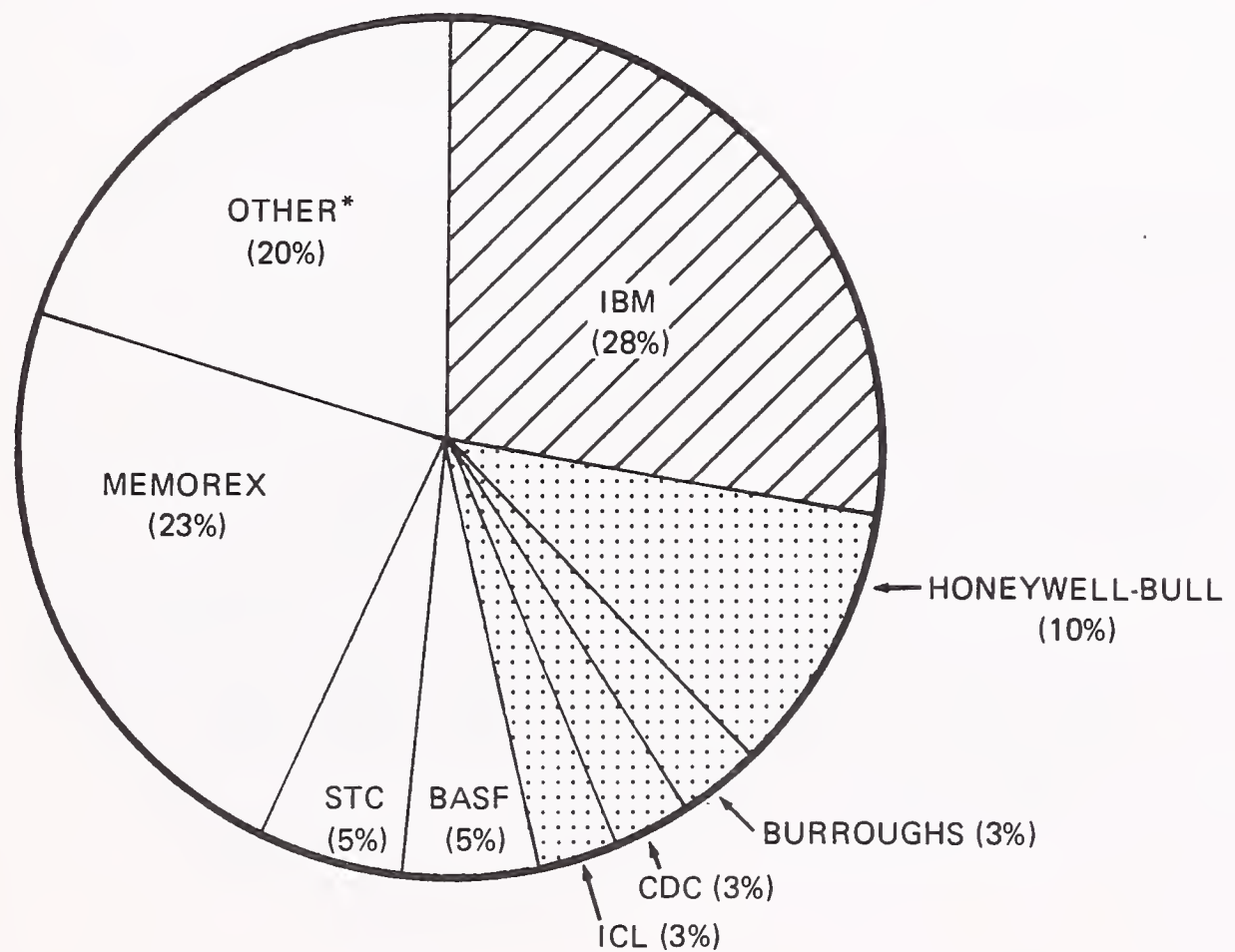





-  IBM (22%)
-  OTHER MAINFRAME (26%)
-  NON-MAINFRAME (52%)

* INCLUDES SINGLE MENTIONS EACH OF: INFOREX, INTERTECHNIQUE, IPC, ITT, LOGABAX, PHILIPS, SOFREMA, SWEDA, TERKALEC, TEXAS INSTRUMENTS, VERSATEC, ITTEL.

EXHIBIT B-9

RESPONDENTS' PLUG COMPATIBLE PERIPHERAL MAINTENANCE VENDORS:
FRANCE

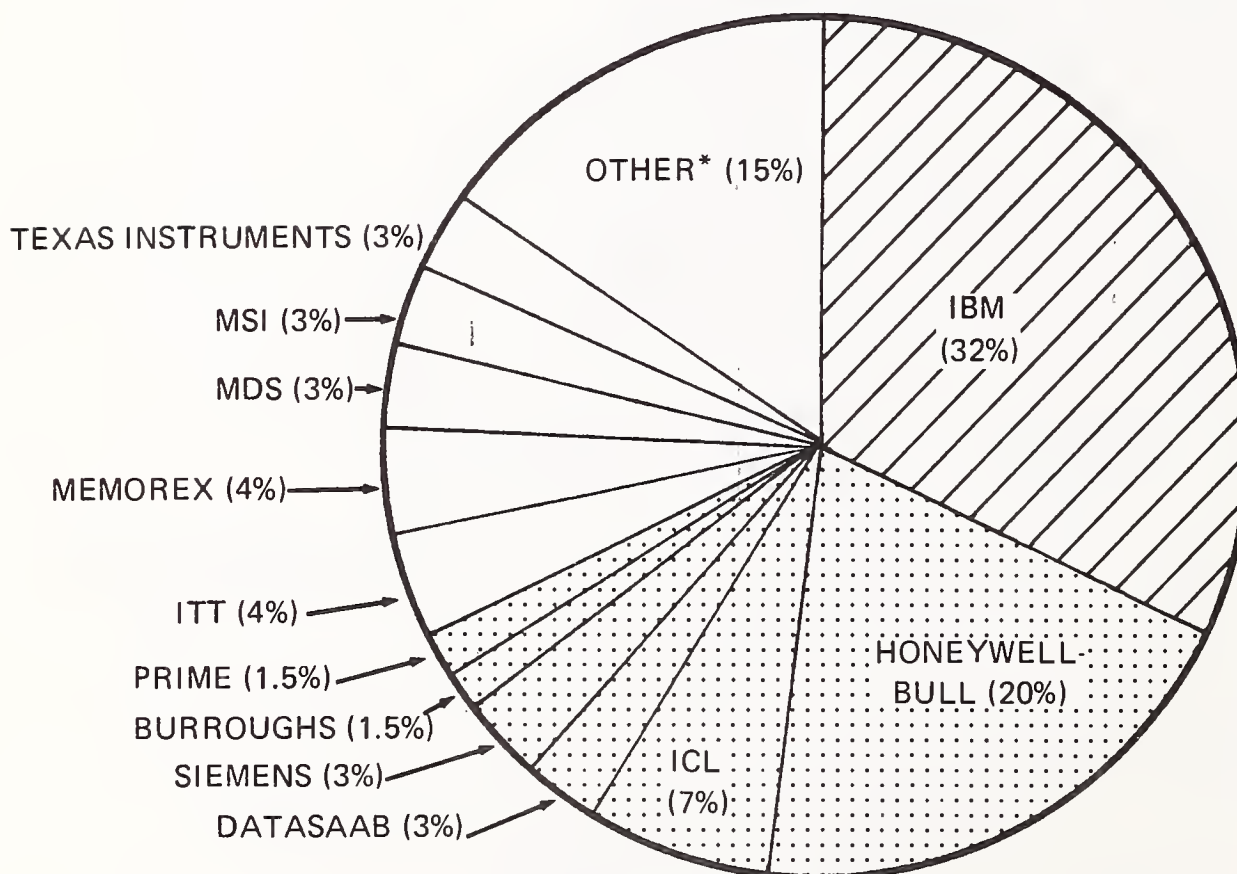





-  IBM (28%)
-  OTHER MAINFRAME (19%)
-  NON-MAINFRAME (53%)

*INCLUDES SINGLE MENTIONS EACH OF: COITEL, DOCUMATION, ITT, MULTIBAIL, OLIVETTI, PHILIPS, TRANSAC, YREL.

EXHIBIT B-10

RESPONDENTS' TERMINAL MAINTENANCE VENDORS: FRANCE

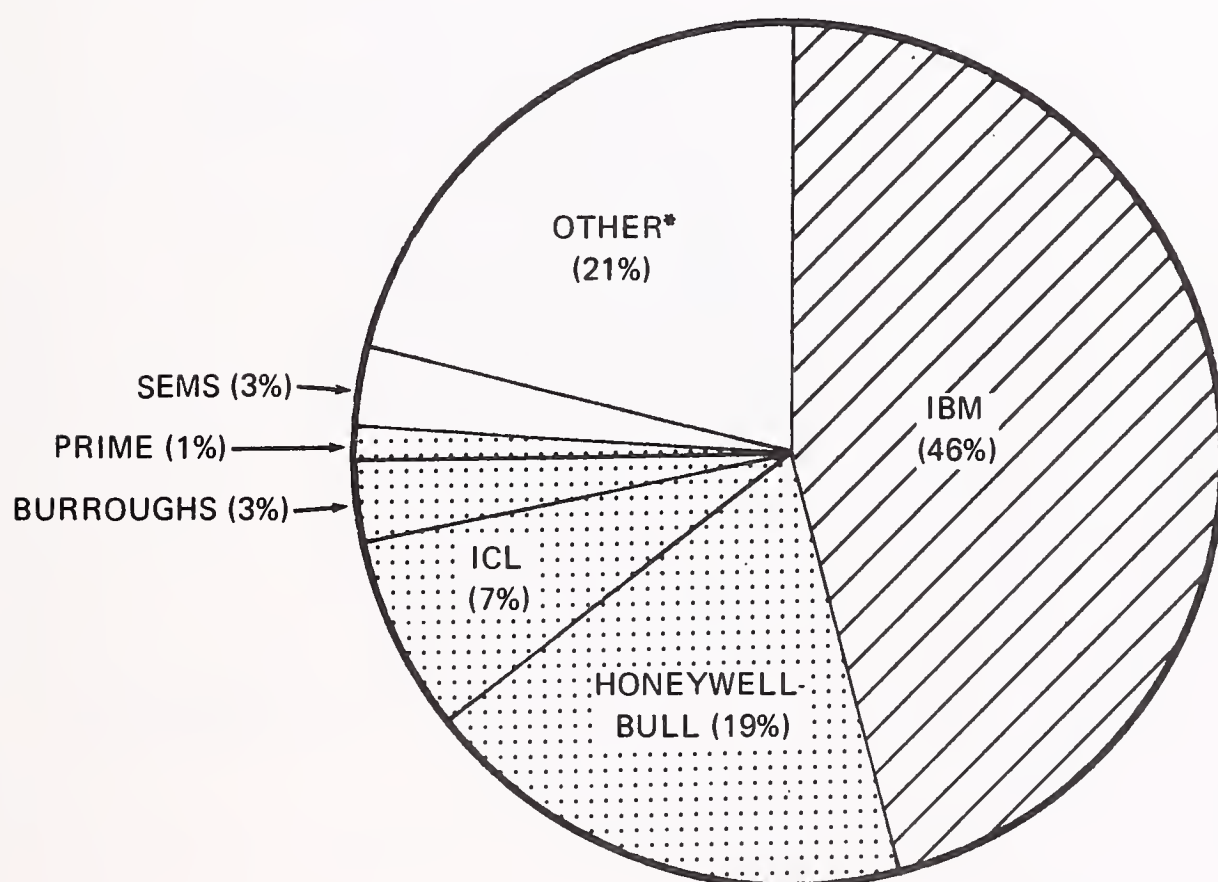





-  IBM (32%)
-  OTHER MAINFRAME (36%)
-  NON-MAINFRAME (32%)

* INCLUDES SINGLE MENTIONS EACH OF: ANDERSON-JACOBSON, GEWEKE, LINE-DATA, MATRA, OLIVETTI, PERKIN-ELMER, PHILIPS, THAMSON CSF, TRANSAC, YREL

EXHIBIT B-11

RESPONDENTS' SYSTEMS SOFTWARE MAINTENANCE VENDORS: FRANCE

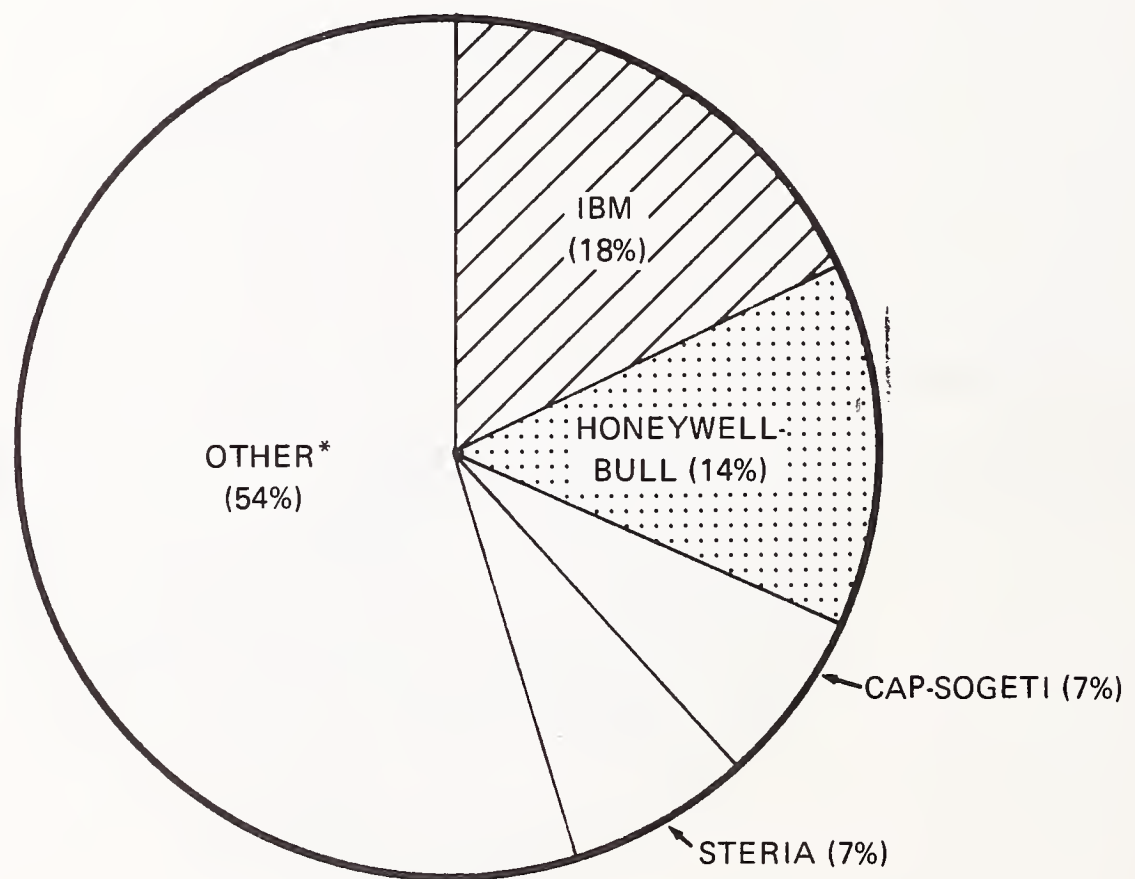





-  IBM (46%)
-  OTHER MAINFRAME (30%)
-  NON-MAINFRAME (24%)

*INCLUDES SINGLE MENTIONS EACH OF: AGI PEC-RHIN, CAP-SOGETI, CGI, CICS, LINE-DATA, MARK IV INFORMATICS, PAC, PHILIPS, SLIGOS, SOLVA, TANDEM, TELECOMPUTING, TOTAL 7, TRANSAC, WERLINGHAM.

EXHIBIT B-12

RESPONDENTS' APPLICATIONS SOFTWARE MAINTENANCE VENDORS:
FRANCE

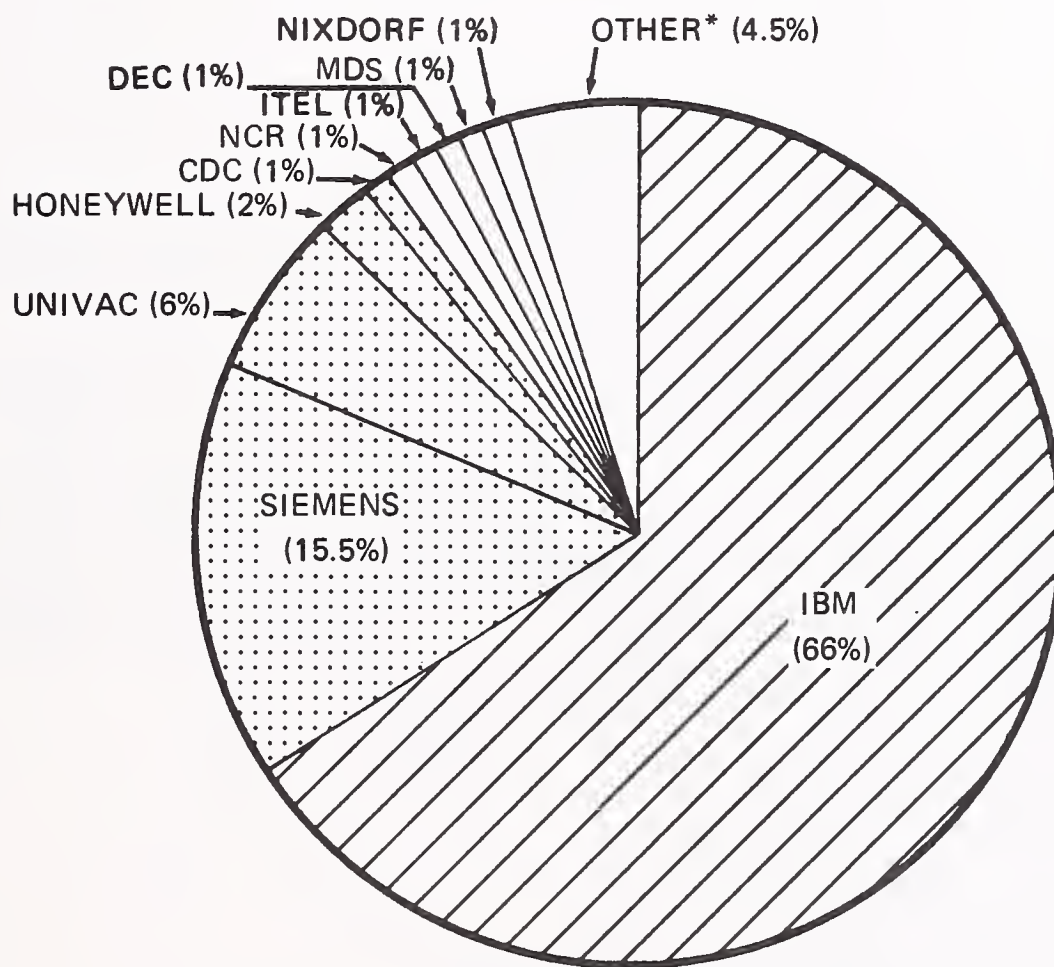


-  IBM (18%)
-  OTHER MAINFRAME (14%)
-  NON-MAINFRAME (68%)

*INCLUDES SINGLE MENTIONS EACH OF: ADR, AIR FRANCE, CARUS FRANCE, CECOC PUITIERS, CGI, CINCOM SYSTEMS, LINE-DATA, MATRA, PEC-RHIN, SCOD, SLIGOS, SOLVA, SOPRA, TITN, VERSATEC.

EXHIBIT B-13

RESPONDENTS' MAINFRAME MAINTENANCE VENDORS: WEST GERMANY

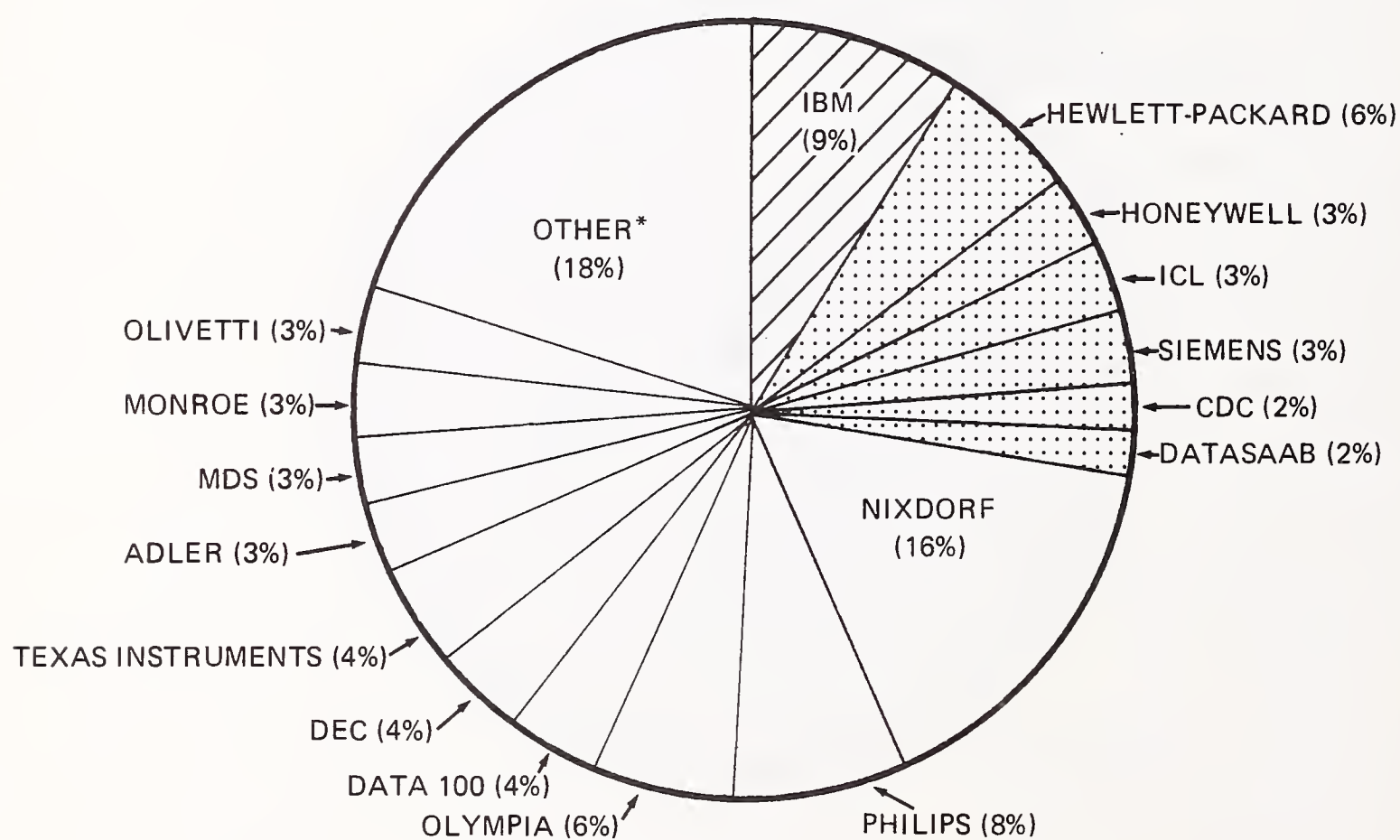





- ☒ IBM (66%)
- ☒ OTHER MAINFRAME (24.5%)
- ☐ NON-MAINFRAME (9.5%)

*INCLUDES SINGLE MENTIONS EACH OF: CMI, DATA 100, NAS, NGR-DPI

EXHIBIT B-14

RESPONDENTS' SMALL BUSINESS SYSTEM AND MINICOMPUTER MAINTENANCE VENDORS: WEST GERMANY

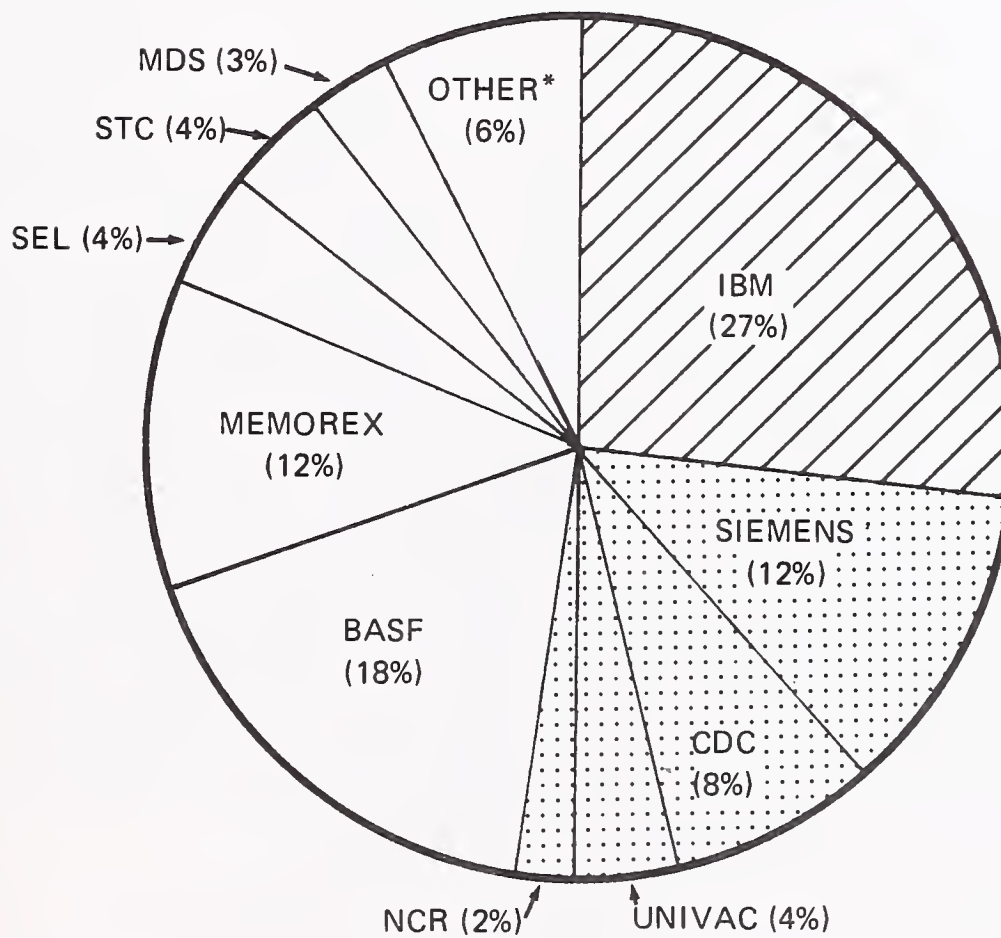





-  IBM (9%)
-  OTHER MAINFRAME (19%)
-  NON-MAINFRAME (72%)

*INCLUDES: AUTOCOMP, BUROHANDEL, CANON, CMC, CTM, DOCUMATION, DPI, GIER, KEINZLE, SACKINGER, SUMLOCK.

EXHIBIT B-15

RESPONDENTS' PLUG COMPATIBLE
PERIPHERAL MAINTENANCE VENDORS:
WEST GERMANY



-  IBM (27%)
-  OTHER MAINFRAME (26%)
-  NON-MAINFRAME (47%)

*INCLUDES SINGLE MENTIONS EACH OF: CALCOMP, DOCUMATION, INTERDOM, ITT.

EXHIBIT B-16

RESPONDENTS' TERMINAL MAINTENANCE VENDORS :
WEST GERMANY

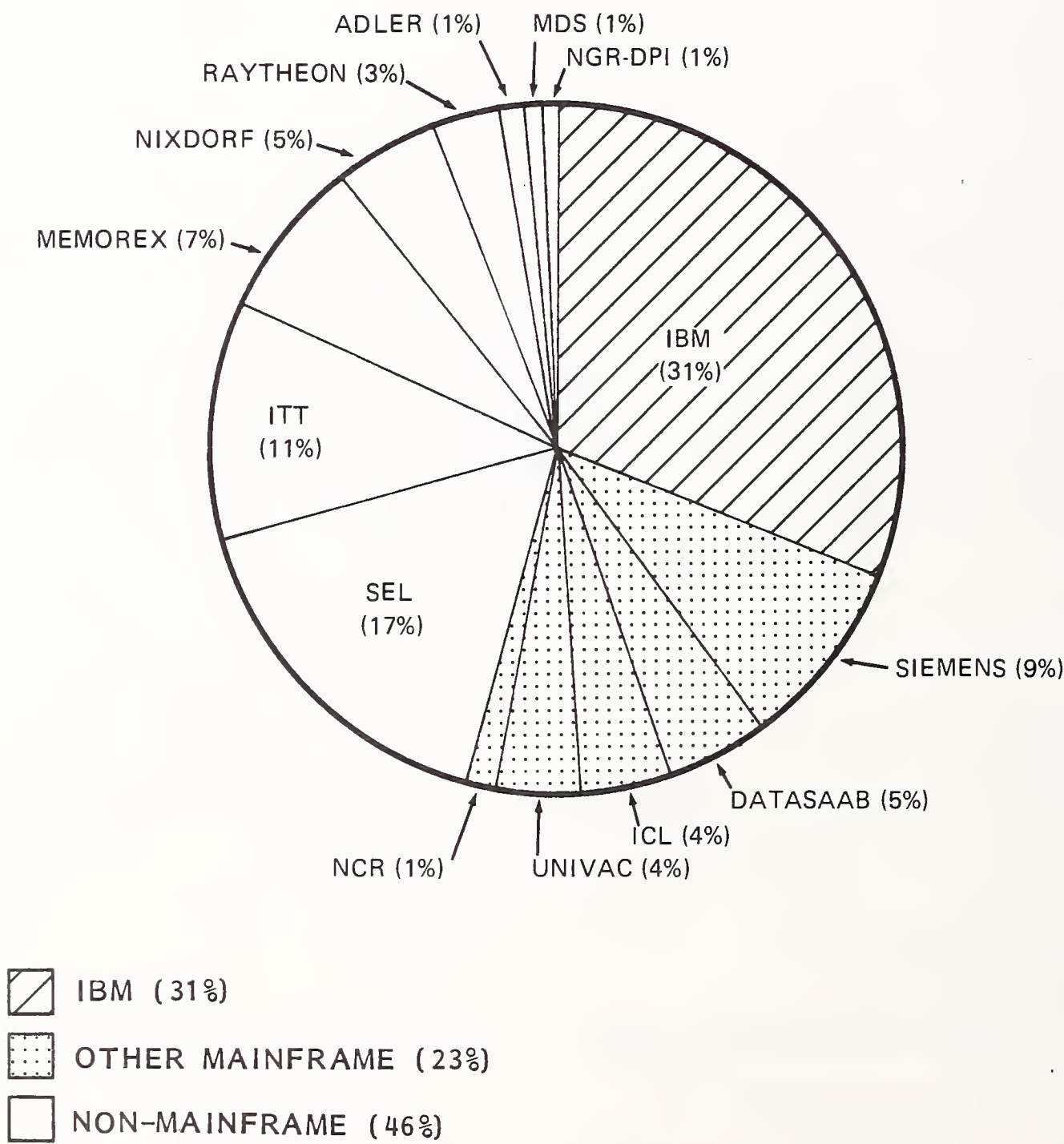
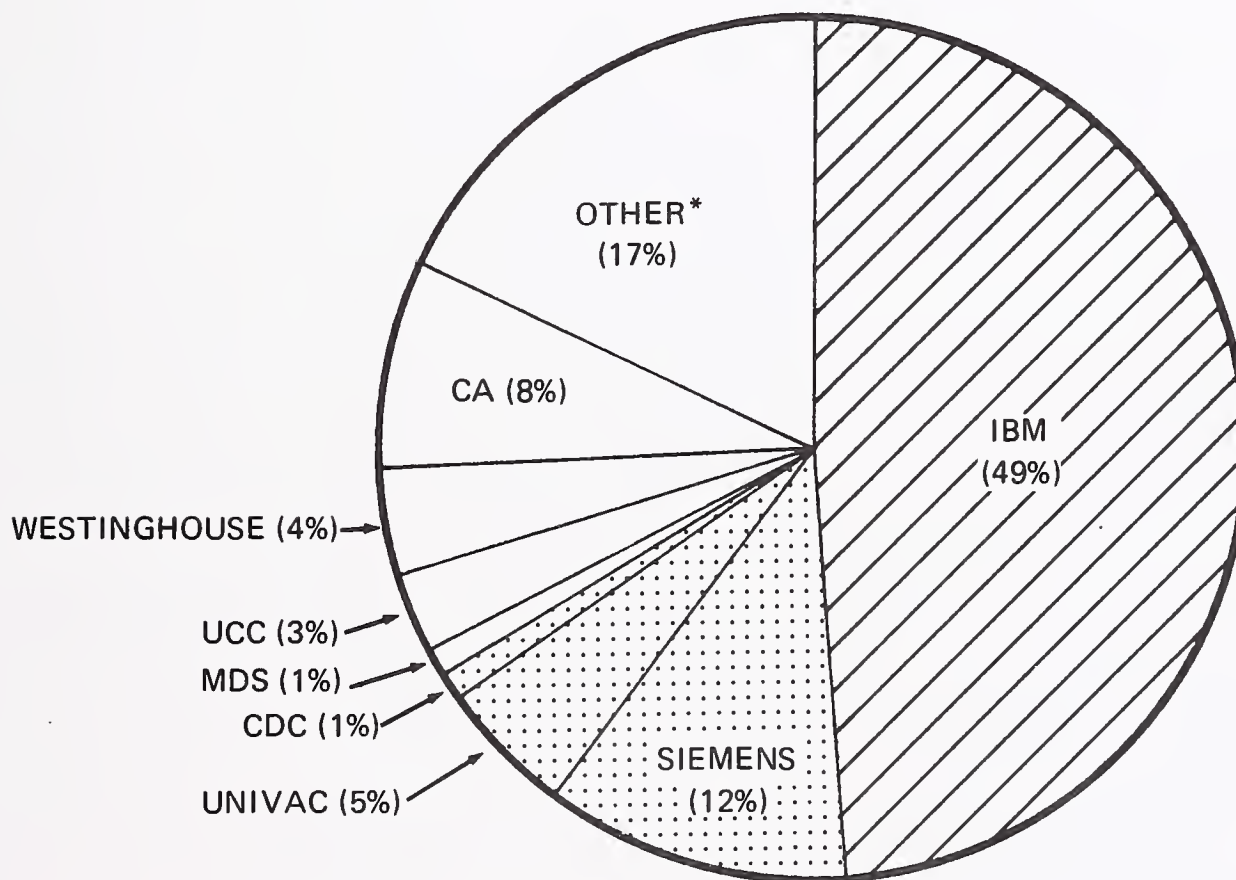





EXHIBIT B-17

RESPONDENTS' SYSTEMS SOFTWARE MAINTENANCE VENDORS:
WEST GERMANY

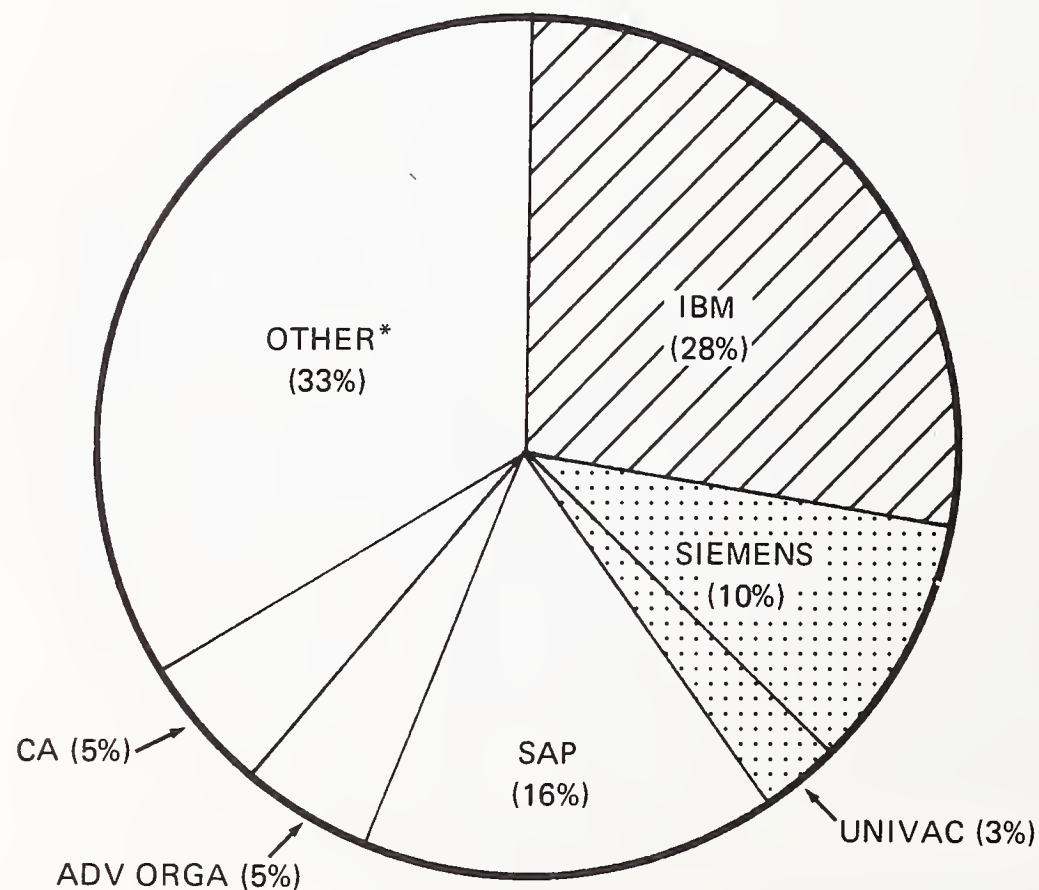


-  IBM (49%)
-  OTHER MAINFRAME (18%)
-  NON-MAINFRAME (33%)

*INCLUDES: ADR ROSCOE, CEDA, CINCOM, DIALOGICE, HUBNER & MESGARD, INFOSOFT, JOHNSON, NER-DPI, PANSOPHIC, PLUS-SOFT, RENDER, THOS.

EXHIBIT B-18

RESPONDENTS' APPLICATIONS SOFTWARE MAINTENANCE VENDORS:
WEST GERMANY



- ☒ IBM (28%)
- ☒ OTHER MAINFRAME (13%)
- ☐ NON-MAINFRAME (59%)

*INCLUDES: ADR ROSCOE, EUROPEAN SOFTWARE CO., INFOSOFT, LAMMERT, ORGA-RATIO, PAISY, RADOPLAN, SCS, SYSTEM AG, TON BELLES, DR. WESTERNFICHER, WILKEN.

APPENDIX C: QUESTIONNAIRES

EUROPEAN FIELD SERVICE ANNUAL REPORT

USER QUESTIONNAIRE

1. Please complete the table below and rate on a scale of 1-5 (1 = low, 3 = medium, 5 = high) the maintenance service you receive.

Equipment Classification	Predominant Vendor's Name	Maintenance Vendor's Name	Maintenance Contract or Time and Materials	Rating of Maintenance Service (circle your response)
a) Medium and Large Mainframes				
b) Small Business Computers				
c) Other Mini-computers				
d) Peripherals (plug compatible)				
e) Terminals				
f) Software: Systems				
g) Software: Applications				

2. a) For how many hours per day have you presently contracted maintenance?

_____ Hours

- b) For how many days a week do you have coverage?

_____ Days

- c) Will this coverage change in the future?

☐ Yes ☐ No

Comments: _____

- d) Does this coverage vary depending on type of equipment?

☐ Yes ☐ No

If yes, please comment:

- e) What happens outside of contracted hours?

3. Please complete the table below in hours:

- Respond time from placing fault call to engineer arriving on site.
- Repair time from engineer arriving on site to machine being returned to you.
- What percent increase in maintenance charges would you pay to move from your current position to your ideal position?

Equipment Classification	What Is Your Minimum Acceptable Level		What Is Your Current Average		What Is Your Ideal, Considering the Real World		Percent Willing to Pay
	Respond	Repair	Respond	Repair	Respond	Repair	
a) Medium and Large Mainframes							
b) Small Business Computers							
c) Other Mini-computers							
d) Peripherals (plug compatible)							
e) Terminals							
f) Software: Systems							
g) Software: Applications							

4. Rate the importance to you of the following field maintenance characteristics on a scale of 1-5 (1 = low, 3 = medium, 5 = high).

Factor	Rating (circle your response)
a) Mean Time to Respond (in person)	<div style="text-align: center;"> ----- 1 2 3 4 5</div>
b) Mean Time to Repair (of equipment) (<u>not</u> including response time)	<div style="text-align: center;"> ----- 1 2 3 4 5</div>
c) Regularly Scheduled Preventive Maintenance	<div style="text-align: center;"> ----- 1 2 3 4 5</div>
d) Other (specify)	<div style="text-align: center;"> ----- 1 2 3 4 5</div>

5. During the past two years have you or are you currently replacing any hardware due to poor maintenance?

a) Yes _____

b) No _____

c) If yes:

- Vendor _____
- Type of Machine _____
- Maintenance Vendor _____

6. Over the same period have you or are you replacing any software due to poor maintenance?

a) Yes _____

b) No _____

c) If yes:

- Vendor _____

- Type of Software _____

- Maintenance Vendor _____

7. During the past year how would you rate the quality of the field service engineers that service your installation compared to earlier years?

_____ Same Quality

_____ Poorer Quality

_____ Improved Quality

Please comment: _____

8. During the past year how would you rate the quality of the field service management that is responsible for your installation compared to earlier years?

_____ Same Quality

_____ Poorer Quality

_____ Improved Quality

Please comment: _____

9. As a result do you currently perform any of the following maintenance activities?

	<u>Perform</u>		<u>Cost Saving Percent</u>	<u>Consider</u>		<u>Expected Cost Saving</u>
a) Install equipment	Y	N	_____	Y	N	_____
b) Perform diagnostics before calling for vendor maintenance	Y	N	_____	Y	N	_____
c) Perform maintenance on your hardware system	Y	N	_____	Y	N	_____
d) Perform maintenance on vendor-supplied software	Y	N	_____	Y	N	_____
e) Deliver equipment to vendor maintenance depot for repair or replacement	Y	N	_____	Y	N	_____

10. Do any of your vendors provide a remote diagnostic capability?

☐ Yes ☐ No

a) If yes, which vendor provides this service? _____

If yes, for which equipment type? _____

b) How long has it been provided? _____ Months

c) How would you rate the quality of your maintenance service with this remote diagnostic capability?

- _____ Same Quality
- _____ Improved Service
- _____ Poorer Service

Please comment: _____

11. Has this remote diagnostic capability reduced your maintenance costs?

☐ Yes ☐ No

a) If yes, by what percent have your maintenance costs decreased?

_____ % Decrease

12. If offered remote diagnostics, what would be your reaction?

13. Do any of your vendors provide a formal escalation procedure as part of their maintenance activities?

☐ Yes ☐ No

Vendor _____

Equipment _____

a) If yes, what affect has this had on the maintenance support that has been provided to you?

b) If no, do you believe that a formal escalation procedure would provide improvements over the present level of maintenance support you are receiving?

☐ Yes ☐ No

How would it help? _____

14. Would you prefer to buy products from a vendor who provides a formal escalation procedure as a part of their maintenance activities?

☐ Yes ☐ No

15. What other new maintenance techniques have your vendors introduced in the past year?

- a) How effective have they been?

16. What is your current budget for EDP? \$ _____

What portion of this is spent on: (\$ or %)

	1980	1982	1985
a) Hardware			
b) Software			
c) Personnel			
d) Hardware Maintenance			
e) Software Maintenance			

17. How have your maintenance costs changed in the last 12 months compared to earlier years?

	<u>More (%)</u>	<u>Less (%)</u>	<u>Same</u>
--	-----------------	-----------------	-------------

In absolute \$			
Relative to Value of Equipment			

18. What do you plan to do about rising maintenance costs?

19. At what point does this become a problem?

There have been some recent changes in the manner vendors charge for maintenance services. These changes have been primarily in providing an incremental pricing structure where individual maintenance activities are billed separately.

20. For which types of equipment would you prefer maintenance to be billed as a:

a) Fixed monthly maintenance charge? _____

_____ (equipment type)

b) Incremental maintenance charge based on service provided? _____

_____ (equipment type)

Why? _____

21. Would you be willing to pay for on-site spares for your installation?

☐ Yes ☐ No

a) If yes, what advantages?

b) If no, why not?

22. For what percentage of cost saving in your maintenance contract would you eliminate preventive maintenance (PM)? (encircle)

a) Would Not Consider Elimination of PM

b) < 5% of Contract Cost

c) 5-10% of Contract Cost

d) 11-20% of Contract Cost

e) 21-30% of Contract Cost

f) > 30%

23. If currently using a third party for maintenance, please state the reasons.

a) What is the percent savings?

_____ %

24. If you are not currently using a third party for maintenance, would you consider it?

a) Yes _____

b) No _____

If no, why not?

- c) If yes, please state the reasons for using a third party for maintenance.

- d) What is the expected savings (if any)?

_____ %

25. What, in your opinion, would improve your maintenance service? How important are these?

	<u>High</u>	<u>Medium</u>	<u>Low</u>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

26. What maintenance needs or service requirements do you have which are not now being met?

27. In the next two years, do you expect to see your quality of maintenance improve, stay the same, or decline?

☐ Improve ☐ Same ☐ Decline

- All information is treated in strictest confidence.
- A photo copy of your current maintenance agreement would greatly assist our survey.
- Thank you for your cooperation.

EUROPEAN FIELD SERVICE ANNUAL REPORT
VENDOR QUESTIONNAIRE

Please complete this questionnaire based on local field service operations in

I. FIELD SERVICE ORGANISATION

1. What is the title of your senior corporate executive for field service?

- a) To whom does he/she report? _____

2. In your company, is the field service organisation treated as a:

☐ Profit Center

☐ Cost Center

- a) What percent of revenue is your profit objective?

_____ %

- b) If it is currently a cost center, do you see this changing to a profit center?

☐ Yes ☐ No

If yes, when will this occur? _____

3. During the past year have you made any major changes in the structure of your field service organisation?

☐ Yes ☐ No

If yes, what were these changes?

a) _____

b) _____

c) _____

4. What is the current size of your field service organisation?

- a) How many of these are field engineers? _____
- b) How many are technical support engineers? _____
- c) How many are field management? _____
- d) How many are administrative? _____

5. During the past year did the size of your field service organisation:

- ☐ Increase _____ %
- ☐ Decrease _____ %
- ☐ Remain the same

a) What were the primary reasons for these changes?

- 1) _____
- 2) _____
- 3) _____

6. a) How many field engineering offices do you presently have?

b) 1) How many sites do you have where engineers are permanently based?

2) Has this changed in the last year?

☐ Increased ☐ Same ☐ Decreased

3) By what number?

7. What percentage of the total maintenance organisation is located at divisional (regional) and headquarters locations?

_____ %

8. a) How many field engineers did you hire last year? _____
b) How many field engineers did you lose? _____

9. What were the three most important reasons for losing field engineering personnel?

- a) _____
b) _____
c) _____

10. Will the number of field engineers required increase:

Percent Increase

- | | | | | |
|----|----------|------------------------------|-----------------------------|---------|
| a) | In 1980? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | _____ % |
| b) | In 1982? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | _____ % |
| c) | In 1984? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | _____ % |

- d) Please comment on the causes of these changes:

11. When you add or replace field service personnel, what are the primary sources? Please rate the following sources on a scale of 1-5 (1 = low, 3 = medium, 5 = high).

Factor	Rating (1980)	Rating (1985)
a) Hire and train yourself (no technical pretraining)	<div><div></div><div></div><div></div><div></div><div></div></div> <div>12345</div>	<div><div></div><div></div><div></div><div></div><div></div></div> <div>12345</div>
b) Recruit from competition	<div><div></div><div></div><div></div><div></div><div></div></div> <div>12345</div>	<div><div></div><div></div><div></div><div></div><div></div></div> <div>12345</div>
c) Recruit from other industries	<div><div></div><div></div><div></div><div></div><div></div></div> <div>12345</div>	<div><div></div><div></div><div></div><div></div><div></div></div> <div>12345</div>
d) Trained, discharged armed forces personnel	<div><div></div><div></div><div></div><div></div><div></div></div> <div>12345</div>	<div><div></div><div></div><div></div><div></div><div></div></div> <div>12345</div>
e) Recruit from other functions within your company (e.g., manufacturing, engineering)	<div><div></div><div></div><div></div><div></div><div></div></div> <div>12345</div>	<div><div></div><div></div><div></div><div></div><div></div></div> <div>12345</div>
f) Trade schools	<div><div></div><div></div><div></div><div></div><div></div></div> <div>12345</div>	<div><div></div><div></div><div></div><div></div><div></div></div> <div>12345</div>
g) Other (describe)	<div><div></div><div></div><div></div><div></div><div></div></div> <div>12345</div>	<div><div></div><div></div><div></div><div></div><div></div></div> <div>12345</div>

12. The following are potential problems associated with field service organisations. Please rate on a scale of 1-5 (1 = low, 3 = medium, and 5 = high).

Factor	Rating					
a) Morale of maintenance force	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5
1	2	3	4	5		
b) Recruiting field maintenance personnel	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5
1	2	3	4	5		
c) Training field maintenance personnel	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5
1	2	3	4	5		
d) Reducing labour turnover	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5
1	2	3	4	5		
e) Product quality	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5
1	2	3	4	5		
f) Adequate diagnostic equipment	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5
1	2	3	4	5		
g) Adequate remote diagnostic assistance	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5
1	2	3	4	5		
h) Marketing demands	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5
1	2	3	4	5		
i) Customer demands	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5
1	2	3	4	5		
j) Budget limitations	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5
1	2	3	4	5		
k) Competitive salary/compensation	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5
1	2	3	4	5		
l) Spare parts shortage	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5
1	2	3	4	5		
m) Asset control	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5
1	2	3	4	5		
n) Technical competence of engineer	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>	1	2	3	4	5
1	2	3	4	5		

II. FIELD SERVICE SALARIES

1. For the following general categories of field service personnel, what is the average salary and salary range? How has and how will these change?

	<u>Average Salary</u>	<u>Range</u>	<u>% Increase '78 to '79</u>	<u>% Increase '79 to '80</u>
Trainee	_____	_____ to _____	_____ %	_____ %
Qualified Field Engineer	_____	_____ to _____	_____ %	_____ %
Senior Field Engineer	_____	_____ to _____	_____ %	_____ %

2. What are the primary reasons for salary increases?

- a) _____
- b) _____
- c) _____

3. Do you currently have an incentive program for your field engineers?

☐ Yes ☐ No

Please describe:

III. UNIONS

1. Is your field engineering workforce unionised (or part)?

☐ Yes ☐ No

a) If yes, which union? _____

b) If no, do you see this happening?

☐ Yes ☐ No

When? _____

IV. LEVEL OF SUPPORT

1. What percentage of total field engineering manhours was spent in installing engineering change notices (ECN) during 1979?

_____ %

Comments:

2. What is the average number of 'trouble calls' in a month?

a) What percentage of these are 'repeat calls'; i.e., a second call within two weeks about the same problem?

_____ %

b) What percentage of total calls had no faults found? _____ %

3. Do field engineers currently replace components, boards or units at the user's site?

☐ Components ☐ Boards ☐ Units

- a) Are these parts then repaired on-site, at a depot or at the factory?

☐ On-Site ☐ Depot ☐ Factory

- b) In 1984 will field engineers replace components, boards or units on-site?

☐ Components ☐ Boards ☐ Units

4. For each type of product offered by your company, what is the:

Equipment Classification	Average Percentage Uptime (Percent)	Average Mean Time Between Failure (Hours)	Average Mean Time to Repair (Hours)	Average Mean Time to Respond (Hours)
a) Medium and Large Mainframes				
b) Small Business Computers				
c) Other Minicomputers				
d) Peripherals (plug compatible)				
e) Terminals				

5. How important do you feel are the following field maintenance characteristics to your users? Please rate on a scale of 1-5 (1 = low, 3 = medium, 5 = high).

Factor	Rating (circle your response)										
a) Mean Time to Respond (in person)	<table><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>						1	2	3	4	5
1	2	3	4	5							
b) Mean Time to Repair (of equipment)	<table><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>						1	2	3	4	5
1	2	3	4	5							
c) Regularly Scheduled Preventive Maintenance	<table><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>						1	2	3	4	5
1	2	3	4	5							
d) Stable Engineering Population	<table><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>						1	2	3	4	5
1	2	3	4	5							
e) Other (please specify)	<table><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr></table>						1	2	3	4	5
1	2	3	4	5							

6. Do you receive engineering technical support from:

a) U.S.A.

☐

Yes

☐

No

Describe: _____

b) Other European Countries

☐

Yes

☐

No

Describe: _____

7. Where are your engineers trained?

- a) Your Own Country _____ %
- b) Other European Countries _____ %
- c) U.S.A. _____ %
- d) Other _____ %

8. Do you have a defined management training program for your engineers?

- ☐ Yes ☐ No

Describe: _____

VI. REMOTE DIAGNOSTICS

1. Do you provide a remote diagnostic capability as part of your field service support?

- ☐ Yes ☐ No

a) If yes, when did you begin offering this capability? _____

1) What were the primary reasons for implementing it?

2) Is this remote diagnostic capability for:

☐ Hardware ☐ Software ☐ Both

3) How has this remote diagnostic capability affected your maintenance costs?

☐ Increased _____ %

☐ Decreased _____ %

☐ Remained the same

4) What has been your customers' reaction to this remote diagnostic capability?

b) If you do not currently have a remote diagnostic capability, do you have any plans to implement one?

☐ Yes ☐ No

1) If yes, when will such a capability be available to your customers?

2) If no, why not?

VII. FORMAL ESCALATION PROCEDURES

1. Within your field service organisation, do you have a formal escalation procedure for handling maintenance calls?

☐ Yes ☐ No

- a) If yes, what are the general parameters of this escalation procedure?

- b) If no, how are trouble situations that cannot be solved by the local field engineer handled in your organisation?

2. a) What percent of your clients know of these procedures?

_____ %

- b) Please rate on a scale of 1-5 the importance of these escalation procedures to your client. (1 = low, 3 = medium, 5 = high)

1	2	3	4	5

Comments: _____

VIII. FIELD SERVICE DOCUMENTATION

1. During the past year have you made any major changes in the types of field service documentation provided to your customers?

☐ Yes ☐ No

- a) If yes, what were the types of changes made to the documentation and its distribution to customers?

- b) Why were these changes implemented?

2. During the next two years will you be providing your customers with:

☐ More Documentation
☐ Less Documentation
☐ Same as Present

- a) Why will these changes be made?

IX. SPARES INVENTORY

1. What is the percentage distribution of spares among the following locations?

Manufacturing Facility _____ %

Spares Warehouses _____ %

Branch Offices _____ %

Engineer-Held _____ %

Customer Locations _____ %

100%

2. During the past year has there been an increase in the number of customers who maintain spares at their location?

☐

Yes

☐

No

_____ % Increase

Why?

3. a) Have you actively engaged on an asset reduction program regarding spares holding?

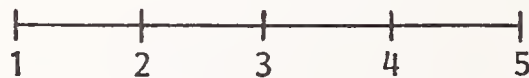
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Yes

☐

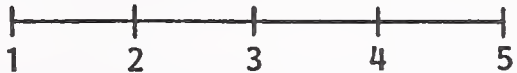
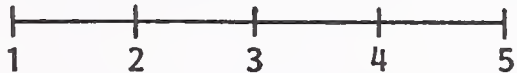

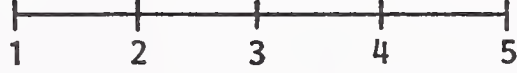
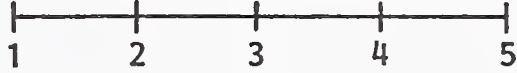
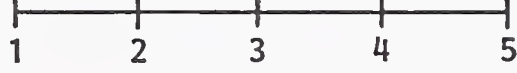
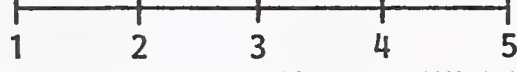


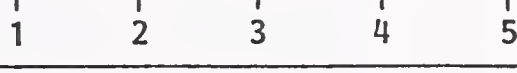
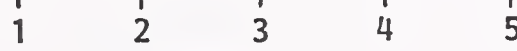
No

- b) Please rate its success on a scale of 1-5 (1 = low, 3 = medium, 5 = high).



X. MAINTENANCE TECHNIQUES

1. Please rate the impact of the following factors on your current maintenance techniques on a scale of 1-5 (1 = low, 3 = medium, 5 = high).

Factor	Rating
a) Rising labour costs	
b) Increasing product price performance	
c) User performing own maintenance	
d) User and vendor cooperatively testing transmission or computing equipment	
e) Home or personal computers	
f) Multifunction equipment	
g) Built-in diagnostics	
h) Remote diagnostics (via telecommunications)	
i) Distributed data processing	
j) Advances in technology	
k) Other (describe)	

2. Do you have a local repair facility?

☐

Yes

☐

No

XI. RESEARCH AND DEVELOPMENT

1. As a part of your operating budget do you have an allocation for R&D expenditures for improving maintenance techniques?

☐ Yes ☐ No

- a) If yes, what is the approximate percent of this allocation?

_____ %

2. In the development of new products in your company, what is the involvement of the field service organisation?

XII. MAINTENANCE PRICING

1. During the past year what changes have you made in maintenance prices?

☐ Increased _____ %

☐ Decreased _____ %

☐ Remained Same

- a) Which of the following reasons was most important in causing maintenance fees to rise?

- | | |
|-------------------------|--------------------------|
| 1) Inflation | <input type="checkbox"/> |
| 2) Labour Cost | <input type="checkbox"/> |
| 3) Parts Cost | <input type="checkbox"/> |
| 4) Competitor's Pricing | <input type="checkbox"/> |
| 5) Other _____ | <input type="checkbox"/> |

2. During the next year what types of price changes are you planning?

- ☐ Increase _____ %
- ☐ Decrease _____ %
- ☐ Remain the same

a) Which of the following reasons will be most important in causing maintenance fees to rise?

- | | |
|-------------------------|--------------------------|
| 1) Inflation | <input type="checkbox"/> |
| 2) Labour Cost | <input type="checkbox"/> |
| 3) Parts Cost | <input type="checkbox"/> |
| 4) Competitor's Pricing | <input type="checkbox"/> |
| 5) Other _____ | <input type="checkbox"/> |

3. What is the cost of a typical service call? \$ _____

- a) What percentage of this is for labour? _____ %
- b) What percentage is for travel? _____ %
- c) What percentage is for parts and materials? _____ %
- d) What percentage is for other? _____ %

100%

XIII. GENERAL

1. Do you presently use a third party to maintain any of your products?

☐ Yes ☐ No

- a) If no, under what conditions would you consider doing so?

2. Would you consider acting as a third party to maintain other vendors' products?

☐ Yes

☐ No

☐ Currently Do So

3. Have you offered your customers any of the following to increase their participation in maintenance? Were they successful?

	<u>Offered</u>		<u>Successful</u>	
a) Better Documentation	Y	N	Y	N
b) Price Reduction	Y	N	Y	N
c) Faster Response Time	Y	N	Y	N
d) Promised Higher Up-Time	Y	N	Y	N
e) Remote Diagnostics	Y	N	Y	N
f) Easier to Run Diagnostic Routines	Y	N	Y	N
g) Specialized Instrumentation	Y	N	Y	N
h) Improved Diagnostic Displays	Y	N	Y	N
i) Other _____	Y	N	Y	N
_____	Y	N	Y	N
_____	Y	N	Y	N
_____	Y	N	Y	N
_____	Y	N	Y	N

4. How do you measure field engineer productivity?

5. What changes would cause the greatest improvement in the maintenance you provide to your users?

6. What programs do you have now or will you initiate in 1980 to improve productivity? (describe)

We would appreciate receiving, in addition to this questionnaire, a copy of your standard maintenance contract and a field service organisational chart.

THANK YOU VERY MUCH!

